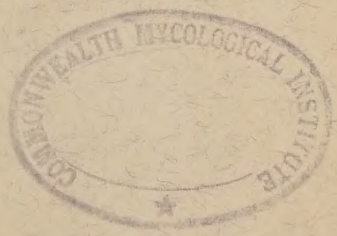
BULLETIN 239 May, 1929

The Rusts of Pennsylvania

(Technical Bulletin—Not for General Distribution)

Kern et al



THE PENNSYLVANIA STATE COLLEGE
SCHOOL OF AGRICULTURE AND EXPERIMENT STATION
STATE COLLEGE, PENNSYLVANIA

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The Bulletins of the Station will be mailed regularly, free of charge, to all residents of the State who request them. Address: Director of Experiment Station, State College, Centre County, Pennsylvania.

The Rusts of Pennsylvania[1]

F. D. Kern, H. W. Thurston, Jr., C. R. Orton, and J. F. Adams

INTRODUCTION

The rusts are a group of strictly parasitic fungi. Since they attack so many of the flowering plants and ferns, many species are of great economic importance. A knowledge of the nature of these parasites is valuable alike to the gardener, the forester, the nurseryman, the orchardist, and the farmer. That these fungi are not better known by such men is due to the fact that they are microscopic in size and become noticeable to the unaided eye only by the symptoms which they produce upon their host plants or by the aggregation of their reproductive parts, the spores, into fruiting bodies or sori of various forms.

Among the rust species of greatest economic importance may be mentioned those which attack cereals and other field and garden crops, such as beans and asparagus; various rusts of ornamentals, such as those on carnation, snapdragon, chrysanthemum, rose, and hollyhock; the fruit and orchard rusts, such as those of brambles, currants, gooseberries, apples, quinces, and pears; and several attacking trees, such as the various rusts of pine, hemlock, poplar, willow, and ash.

This report includes the rusts that are known to occur in the state, together with a list of plants which they attack. The arrangement of the index, which lists the rust species under the name of the host plant, will be of especial value to the beginner. Where more than one rust is known on a given host, an attempt has been made to make distinction easy by means of keys or explanations of diagnostic differences in the text.

Interest in the rusts of Pennsylvania began with the work of Louis David von Schweinitz one hundred years ago. Schweinitz was born in Bethlehem in 1780. He lived and collected in the vicinity of Bethlehem from 1821 until his death in 1834. From his published works on the fungi and from his specimens, many of which are now in the herbarium of the Academy of Natural Science of Philadelphia, Arthur and Bisby [2] have shown that Schweinitz collected 90 species (as at present understood) of North American rusts. Of these, 71 were collected in Pennsylvania, according to information therein presented. It is most interesting to note that 13 of these 71 species are known to-day from Pennsylvania only through his collections.

Since the time of Schweinitz, references to the rusts as they occur in the state, with few exceptions, have been scattered and incidental.

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[1]This paper is the result of work which has been carried on in the Department of Botany of The Pennsylvania State College since 1913. Owing to changes in personnel, only the senior author has been associated continuously with the project during its progress; yet the present resport has been made possible only through the full cooperation of the group, and this paper must be regarded as a joint contribution. It has fallen to the lot of the second author to arrange many of the final details and to place the manuscript in form for publication.

[2]An annotated translation of the part of Schweinitz's two papers giving the rusts of North America. Proc. Amer. Phil. Soc. LVII: 173-292. 1918.

Dr. William Herbst, a resident of Trexlertown, Lehigh County, was a student of fungi and, although primarily interested in the higher basidiomycetes, he included 32 species of rusts in his "Fungal Flora of the Lehigh Valley" (1899). Of this number, three species are there recorded which do not appear in our collections. Dr. J. C. Arthur, in Vol. 7 of the North American Flora, 1907-1927, published by the New York Botanical Garden, gives the distribution of rusts by states, founded on specimens in his herbarium. Pennsylvania is mentioned incidentally as a locality for many species. Mention must also be made of Dr. J. F. Adam's "Rusts on Conifers in Pennsylvania," (Bull. 160, Pennsylvania Agricultural Experiment Station, 1914). This bulletin reports 27 rusts on this restricted group of host plants and includes illustrations and notes as to their economic importance.

The foundation of the present list is the rust collection in the mycological herbarium of the Botany department of The Pennsylvania State College which has been built up largely since 1913. Various members of the staff of the Botany department, as well as many students, have contributed to the collection. Special mention should be made of numerous contributions received from Mr. W. A. McCubbin and his assistants in the Bureau of Plant Industry, State Department of Agriculture, and also of contributions from Dr. O. E. Jennings, of the Carnegie Museum at Pittsburgh, which were collected in the western part of the state during 1907 and 1908 by Dr. D. R. Sumstine.

No attempt has been made to collect systematically in all parts of the state, but it is felt that enough information has been gathered to be representative of the region. In fact, there are comparatively few species whose known range would include Pennsylvania which are not here represented. For brevity, we have omitted localities of individual collections except with the rarer species.

There are listed 158 species of rust fungi belonging to 21 genera, and 412 species of hosts, representing 61 families and 183 genera of higher plants. Of the 158 rusts, 80 are known to be heteroecious, 69 autoecious, and the life history of 9 in this respect is unknown.

No attempt has been made to present the complete synonomy of species, but the original specific combination is presented in every case, together with other important generic combinations that have been in common use. As regards the identity of the species, we have followed the North American Flora but the names used in many cases are not the same, due to a different generic concept. We are not accepting genera founded solely on differences in life-cycle, which has resulted in the recognition of such genera as Puccinia, Uromyces, and Melampsora. Other exceptions will be found in the examination of the list. We are also indebted to the North American Flora for the synonyms and citations. In the arrangement of families and genera we have followed Dietel's revision of the order, Uredinales in Engler and Prantl, Die Natürlichen Pflanzenfamilien (2nd. ed. Band 6, 1928). The authorities for the hosts are, so far as possible, those of Britton and Brown.

ORDER UREDINALES

Family Melampsoraceae

1. UREDINOPSIS Magn. Atti Congr. Bot. Genova 167. 1893.

Cycle of development includes pycnia, aecia, uredinia, and telia, with distinct alternating phases; heteroecious. Telia rudimentary, sometimes not developed, teliospores, frequently solitary in the tissues; uredinia bullate, with peridium; aecia cylindrical.

1. Uredinopsis Osmundae Magn. Hedwigia **43**: 123. 1904.

Milesia Osmundae Arth. Result. Sci. Congr. Bot. Vienne 337. 1906.

On Osmundaceae, II, III:

Osmunda cinnamomea L.

Osmunda Claytoniana L.

Not common in Pennsylvania;—northeastern United States.

The pycnia and aecia are known to occur on *Abies balsamea* but have not been collected in Pennsylvania.

2. Uredinopsis mirabilis (Peck) Magn. Hedwigia **43**: 121. 1904.

Septoria mirabilis Peck. Ann. Rep. N. Y. State Mus. **25**: 87. 1873.

Peridermium balsameum Peck, Ann. Rep. N. Y. State Mus. **27**: 104. 1875.

On Polypodiaceae, II, III:

Onoclea sensibilis L.

Fairly common in Pennsylvania;—northeastern United States.

The pycnia and aecia are known to occur on *Abies balsamea* but have not been collected in Pennsylvania. Some specimens have two kinds of urediniospores, one obovate or angular with thick walls, and the other fusiform, with apex acute or beaked, and thin walls. The significance of the two types of spores is uncertain.

2. HYALOPSORA Magn. Ber. Deuts. Bot. Ges. **19**: 582. 1901.

Cycle of development includes pycnia, aecia, uredinia, and telia, with distinct alternating phases; heteroecious. Telia indehiscent; uredinia roundish, bullate, dehiscent; aecia cylindrical.

3. Hyalopsora Polypodii (DC) Magn. Ber. Deuts. Bot. Ges. **19**: 582. 1901.

Uredo Polypodii DC. Fl. Fr. **6**: 81. 1815.

On Polypodiaceae, II, III:

Filix fragilis (L.) Underw.

Rare in Pennsylvania;—northeastern United States.

The pycnia and aecia of this species are unknown. One of the two collections known in the state was made in the spring on a potted fern in the greenhouse, at State College, Pennsylvania. This fern had been brought in from the nearby woods the previous fall. It is possible that the rust may be perennial on the fern host. Weir & Hubert (Phytopath. **8**: 37-38. 1918) have suggested that this rust has no alternate host, but that the ferns become infected from teliospores which overwinter on the dead fronds. It is more likely that the urediniospores, particularly those with heavy walls, persist through the winter, and start new infections in the spring.

3. MILESIA F. B. White, Scott. Nat. **4**: 162. 1877.

Cycle of development includes pycnia, aecia, uredinia, and telia, with distinct alternating phases; heteroecious. Aecia, cylindrical; uredinia bullate, dehiscent by a central pore; teliospores 2-6 celled, colorless, occurring within the epidermal cells.

4. Milesia pycnograndis (Bell) Arth. N. Am. Fl. **7**: 685. 1925.

Uredinopsis polypodophila Bell. Bot. Gaz. **77**: 25. 1924.

On Polypodiaceae, II, III:

Polypodium vulgare L.

Known in the United States only from a single locality in central Pennsylvania.

In Ontario, Canada, the pycnia and aecia are said to occur on the leaves of *Abies balsamea*. This connection has not been proved by cultures.

4. CALYPTOSPORA Kühn, Hedwigia **8**: 81. 1869.

Cycle of development includes pycnia, aecia and telia, with distinct alternating phases; heteroecious. Telia extensive, indehiscent; aecia cylindrical.

5. Calyptospora columnaris (Alb. & Schw.) Kühn; Rab.-Wint. Fungi Eur. 3521. 1886 (Hedwigia **26**: 28. 1887.)

Aecidium columnare Alb. & Schw. Consp. Fung. 121. Pl. 5, f. 4. 1805.

Peridermium columnare Schmidt & Kunze. Deuts. Schwamme 6: 4. 140. 1817.

Calyptospora Goeppertiana Kühn, Hedwigia **8**: 81. 1869.

On Pinaceae, O, I:

Abies balsamea[3] (L.) Mill.

On Vacciniaceae, III:

Vaccinium corymbosum L.

Local in central Pennsylvania;—northern United States.

The infection on the high bush blueberry is very conspicuous as a witches' broom.

5. PUCCINIASTRUM Otth. Mitth. Nat. Ges. Bern **1861**: 71. 1861.

Cycle of development includes pycnia, aecia, uredinia, and telia; heteroecious. Telia forming layers in or beneath the epidermis; uredinia hemispherical, dehiscent by a central pore; aecia cylindrical.

6. Pucciniastrum Agrimoniae (Schw.) Tranz. Scripta Bot. Hort. Univ. Petrop. **4**: 301. 1895.

Caeoma (Uredo) Agrimoniae Schw. Trans. Am. Phil. Soc. II, **4**: 291. 1832.

On Rosaceae, II, III:

[4]**Agrimonia Brittoniana* Bickn.

Agrimonia gryposcpala Wallr.

**Agrimonia hirsuta* (Muhl.) Bickn.

Agrimonia parviflora Soland.

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[3]See footnote under *Melampsora Humboldtiana*.

[4]Hosts that are starred are mentioned from Pennsylvania in the North American Flora, but specimens on these hosts have not been seen by the authors.

Common in Pennsylvania;—throughout the United States east of the Rocky Mountains.

In spite of the wide distribution of this rust, the alternate stage is unknown.

7. **Pucciniastrum americanum** (Farl.) Arth. Bull. Torrey Club. **47:** 468. 1920.

Pucciniastrum arcticum americanum Farl. Rhodora **10:** 16. 1908.
On Rosaceae, II, III:
Rubus strigosus Michx.
Not common in Pennsylvania;—northeastern United States.
The pycnia and aecia of this rust are unknown.

8. **Pucciniastrum Hydrangeae** (B. & C.) Arth. Result. Sci. Congr. Bot. Vienne 337. 1906.

Uredo Hydrangeae B. & C.; Seym. Bot. Gaz. **9:** 191. 1884.
Peridermium Hydrangeae Adams. Mycologia **12:** 34. 1920.
On Pinaceae, O, I:
Tsuga canadensis (L.) Carr.
On Hydrangeaceae, II, III:
Hydrangea arborescens L.
Hydrangea paniculata Sieb.
Fairly common in Pennsylvania;—eastern central United States.

9. **Pucciniastrum Myrtilli** (Schum.) Arth. Result. Sci. Congr. Bot. Vienne 337. 1906.

Aecidium? Myrtilli Schum. Enum. Pl. Saell. **2:** 227. 1803.
Peridermium Peckii Thuem. Mitth. Forstl. Vers. Oest. **2:** 320. 1880.
Pucciniastrum minimum Arth. Result. Sci. Congr. Bot. Vienne 337. 1906.
On Pinaceae, O, I:
Tsuga canadensis (L.) Carr.
On Ericaceae, II, III:
Azalea nudiflora L.
On Vacciniaceae, II, III:
Gaylussacia baccata (Wang.) K. Koch.
Gaylussacia frondosa (L.) T. & G.
Polycodium stramineum (L.) Greene.
Vaccinium angustifolium Ait.
Vaccinium corymbosum L.
Vaccinium vacillans Kalm.
Common in Pennsylvania;—eastern and northern United States.

10. **Pucciniastrum pustulatum** (Pers.) Dietel, in E. & P. Nat. Pfl. **1^{1**}:** 47. 1897.

Uredo pustulata Pers. Syn. Fung. 219. 1801.
On Onagraceae, II, III:
Epilobium adenocaulon Haussk.
Epilobium coloratum Muhl.
Not common in Pennsylvania;—northern United States.
The pycnia and aecia of this rust are known to occur on several species of Abies especially in the northwestern states.

11. Pucciniastrum Pyrolae (Pers.) Diet. in E. & P. Nat. Pfl. 1[1]**: 47. 1897.

Aecidium Pyrolae Pers.; Gmel. Syst. Nat. **2**: 1473. 1791.

On Pyrolaceae, II, III:

Chimaphila maculata (L.) Pursh.

Pyrola americana Sweet.

**Pyrola elliptica* Nutt.

Pyrola rotundifolia L.

Not common in Pennsylvania;—northern United States.

The pycnia and aecia of this rust are unknown.

6. CRONARTIUM[5] Fries, Obs. Myc. 1: 220. 1815.

Cycle of development includes pycnia, aecia, uredinia, and telia with distinct alternating phases; heteroecious. Telia cylindrical or filiform columns; uredinia erumpent; aecia operculate, on the twigs and bark (not the leaves) of Pinus.

12. Cronartium Comptoniae Arth. Bull. Torrey Club **33**: 29. 1906.

Peridermium Comptoniae Orton & Adams, Phytopathology **4**: 24. 1914.

On Pinaceae, O, I:

Pinus densiflora Siebold & Zucc.

Pinus nigra Hoss.

Pinus ponderosa Dougl.

Pinus pungens Lamb.

Pinus rigida Mill.

Pinus virginiana Mill.

On Myricaceae, II, III:

Comptonia peregrina (L.) Coult.

Common in Pennsylvania;—northeastern United States.

On the pines this rust produces a spindle-shaped gall, which appears to be always confined to the trunk or lower branches near the ground. It is often quite destructive to young pines, either stunting them or killing them outright when the trunk is girdled.

13. Cronartium pyriforme (Peck) Hedgc. & Long. Altern. Stage Perid. Pyrif. 3. 1914.

Peridermium pyriforme Peck, Bull. Torrey Club. **6**: 13. 1875.

On Pinaceae, O, I:

Pinus pungens Lamb.

On Santalaceae, II, III:

Commandra umbellata (L.) Nutt.

Believed to be common in Pennsylvania;—northern United States.

This species is very similar to the previous one. On pine the swelling is usually less, the peridium somewhat more evanescent, and the aeciospores are distinctly pyriform and considerably longer.

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[5]Key to the aecia of the Pennsylvania species of cronartium

Aecia on stems or branches of 5 leaved pines ..... C. ribicola

Aecia on stems or branches of 2 and 3 leaved pines

Aecia forming globoid swellings which involve the entire circumference of the stem or branch ..... C. Quercus

Aecia forming fusiform swellings, or if somewhat globoid, involving only a part of the circumference of the stem or branch

Aeciospores large, pyriform, 19-24 x 32-66 μ ..... C. pyriforme

Aeciospores small, ellipsoid, 16-24 x 24-33 μ ..... C. Comptoniae

14. Cronartium Quercus (Brondeau) Schröt.; Sacc. Michelia **2:** 308. 1881.

Uredo Quercus Brondeau; Duby, Bot. Gall. **2:** 893. 1830.

Peridermium Cerebrum Peck. Buffalo Soc. Nat. Sci. **1:** 68. 1873.

Cronartium Cerebrum Hedgc. & Long. Journ. Agr. Res. **2:** 247. 1914.

On Pinaceae, O, I:

Pinus rigida Mill.

Pinus virginiana Mill.

Pinus sylvestris L.

On Fagaceae, II, III:

Quercus velutina Lamb.

Fairly common in Pennsylvania;—throughout the United States except the northern part.

15. Cronartium ribicola Fisch. in Rab. Fungi Eur. 1595. (Hedwigia **11:** 182.) 1872.

Peridermium Strobi Kleb. Abh. Nat. Ver. Bremen **10:** 153. 1887.

On Pinaceae, O, I:

Strobus Strobus (L.) Small.

On Grossulariaceae, II, III:

Ribes nigrum L.

Grossularia cynosbati (L.) Mill.

Grossularia rotundifolia (Michx.) Cov. & Britt.

Common in Pennsylvania;—locally in northern United States.

The white pine blister rust was found for the first time in the United States on nursery white pines near Philadelphia in 1905. In 1910 several other infections were found on imported white pines chiefly in the southeastern part of the state. All of these infections were successfully eradicated. In 1921 the rust was found to be established on both pine and ribes in Wayne county. Since then infections on ribes have been found in forty-three counties, and on pine in Clarion, Potter, Cameron, Clinton, and Lycoming counties as well as Wayne. (W. A. McCubbin, Pennsylvania Bureau of Plant Industry, Report on White Pine Blister Rust for 1928). Eradication of ribes is recommended for the protection of white pine plantations.

7. MELAMPSOROPSIS (Schröt.) Arth. Result. Sci. Congr. Bot. Vienne 338. 1906.

Cycle of development includes pycnia, aecia, uredinia, and telia, with distinct alternating phases; heteroecious; telia waxy, teliospores catenulate; uredinia powdery; aecia flattened laterally, peridium firm.

16. Melampsoropsis Pyrolae (DC) Arth. Result. Sci. Congr. Bot. Vienne 338. 1906.

Aecidium (?) Pirolae DC. Fl. Fr. **6:** 99. 1815.

Peridermium conorum-Piceae Arth. & Kern. Bull. Torrey Club. **33:** 431. 1906.

On Pyrolaceae, II, III:

**Pyrola asarifolia* Michx.

Pyrola chlorantha Sw.

Pyrola elliptica Nutt.

Pyrola secunda L.

Central Pennsylvania;—north central United States.

Pycnia and aecia of this rust are known to occur on *Picea* sp. but have not been found in Pennsylvania, where the rust probably overwinters in the uredinial stage.

17. Melampsoropsis Cassandrae (Peck & Clinton) Arth. Result. Sci. Congr. Bot. Vienne 338. 1906.

Uredo Cassandrae Peck & Clinton; Peck, Ann. Rep. N. Y. State Mus. **30:** 54. 1879.

Peridermium consimile Arth. & Kern, Bull. Torrey Club. **33:** 427. 1906.

On Ericaceae, II, III:

Chamaedaphne calyculata (L.) Moench.

Known in Pennsylvania from a single collection in Centre county;—northeastern and eastern United States.

The pycnia and aecia of this rust are known to occur on Picea sp. and are common in the New England states.

8. COLEOSPORIUM[6] Lev. Ann. Sci. Nat. III. **8:** 373. 1847.

Cycle of development includes pycnia, aecia, uredinia and telia with distinct alternating phases; heteroecious; teliospores compacted laterally into flattened, waxy masses; uredinia yellowish, powdery; aecia operculate, on the leaves (not twigs or bark) of Pinus.

18. Coleosporium Campanulae (Pers.) Lev. Ann. Sci. Nat. III. **8:** 373. 1947.

Peridermium Rostrupi Ed. Fisch. Bull. Soc. Bot. Fr. **41:** clxxi. 1894.

On Campanulaceae, II, III:

Campanulastrum americanum (L.) Small

**Specularia perfoliata* (L.) A. DC.

Rare in Pennsylvania;—northeastern United States.

The aecial stage of this rust is known to occur on Pinus but has not been collected in Pennsylvania.

19. Coleosporium carneum (Bosc) H. S. Jackson, Proc. Ind. Acad. Sci. **1917:** 312. 1918.

Coleosporium Vernoniae B. & C. Grevillea **3:** 57. 1874.

On Pinaceae, O, I:

Pinus rigida Mill.

On Carduaceae, II, III:

Vernonia altissima Nutt.

Vernonia noveboracensis (L.) Willd.

Fairly common on Vernonia in Pennsylvania;—eastern and southern United States.

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[6]Key to the aecia of Pennsylvania species of Coleosporium on the 2- and 3-leaved Pines

Aecia hypophyllous only.
- Spores 16-20 x 22-27 μ ..... C. Ipomoeae
- Spores 18-22 x 29-36 μ ..... C. Terebinthinaceae

Aecia amphigenous
- Aecia inconspicuous peridium delicate ..... C. delicatulum
- Aecia conspicuous, peridium persisting
  - Spores with a distinct smooth spot ..... C. Solidaginis
  - Spores evenly verrucose
    - Spore wall thick, 3-9 μ or more ..... C. carneum
    - Spore wall not over 3.5 μ
      - Outer walls of peridial cells smooth ..... C. Campanulae
      - Outer walls of peridial cells transversely striate ..... C. Helianthi

20. Coleosporium delicatulum (Arth. & Kern) Hedgc. & Long. Phytopath. **3**: 250. 1913.

Peridermium delicatulum Arth. & Kern. Bull. Torrey Club **33**: 412. 1906.

On Pinaceae, O, I:

Pinus echinata Mill.

Pinus nigra Hoss.

Pinus rigida Mill.

On Carduaceae, II, III:

Euthamia graminifolia (L.) Nutt.

Euthamia tenuifolia (Pursh.) Greene.

Common in Pennsylvania;—eastern and southern United States.

21. Coleosporium Helianthi (Schw.) Arthur. N. Am. Fl. **7**: 93. 1907.

Peridermium Helianthi Hedgc. & Hunt, Mycolgia **9**: 240. 1917.

On Pinaceae, O, I:

Pinus virginiana Mill.

On Carduaceae, II, III:

Helianthus decapetalus L.

Helianthus divaricatus L.

Helianthus giganteus L.

Helianthus strumosus L.

Helianthus tuberosus L.

Not common in Pennsylvania;—eastern United States.

22. Coleosporium Ipomoeae (Schw.) Burr. Bull. Ill. Lab. Nat. Hist. **2**: 217. 1885.

Peridermium Ipomoeae Hedgc. & Hunt, Mycologia **9**: 239. 1917.

On Pinaceae, O, I:

Pinus echinata Mill.

Pinus rigida Mill.

On Convolvulaceae, II, III:

Ipomoea hederacea Jacq.

Ipomoea pandurata (L.) Meyer.

Not common in Pennsylvania;—eastern, central and southeastern United States.

23. Coleosporium Solidaginis (Schw.) Thüm. Bull. Torrey Club. **6**: 216. 1878.

Peridermium acicolum Underw. & Earle. Bull. Torrey Club **23**: 400. 1896.

On Pinaceae, O, I:

Pinus echinata Mill.

Pinus nigra Hoss.

Pinus nigra var. *Austriaca* Ends.

Pinus pungens Lamb.

Pinus resinosa Ait.

Pinus rigida Mill.

**Pinus virginiana* Mill.

On Carduaceae, II, III:

Aster acuminatus Michx.

Aster curvescens Burgess

Aster divaricatus L.
Aster ericoides L.
Aster ianthinus Burgess
Aster laevis L.
Aster lateriflorus (L.) Britton
Aster macrophyllus L.
Aster nemoralis Ait.
Aster oblongifolius Nutt.
Aster paniculatus Lam.
Aster prenanthoides Muhl.
**Aster Pringlei* (A. Gray) Britton
Aster puniceus L.
Aster Shortii Hook.
**Aster Tradescanti* L.
Callistephus hortensis Cass.
Solidago altissima L.
Solidago bicolor L.
Solidago Bootii Hook.
Solidago caesia L.
Solidago canadensis L.
Solidago juncea Ait.
Solidago monticola T. & G.
Solidago neglecta T. & G.
**Solidago nemoralis* Ait.
Solidago patula Muhl.
Solidago puberula Nutt.
Solidago rugosa Mill.
Solidago serotina Ait.
Solidago squarrosa Muhl.
Solidago ulmifolia Muhl.

Common in Pennsylvania;—throughout the United States.

This is a common rust on our two and three needle species of pines, and also on many species of asters and goldenrods. Field observations indicate that it may overwinter on the asters and goldenrods as mycelium or by means of urediniospores.

24. **Coleosporium Terebinthinaceae** (Schw.) Arthur. N. Am. Fl. **7**: 93. 1907.

Peridermium Terebinthinaceae Hedgc. & Hunt. Mycologia **9**: 240. 1917.
On Carduaceae, II, III:
Silphium trifoliatum L.

Known in Pennsylvania from a single collection in Centre county;—eastern, central, and southern United States.

Pycnia and aecia of this rust are known to occur on Pinus throughout the southeastern states but have not been found in Pennsylvania.

9. MELAMPSORA[1] Cast. Obs. 2: 18. 1843.

Cycle of development includes pycnia, aecia, uredinia, telia, with distinct alternating phases; heteroecious and autoecious; telia in waxy layers; uredinia powdery; aecia without peridium or paraphyses.

25. Melampsora Abietis-canadensis (Farl.) Ludwig. Phytopath. 5: 279. 1915.

Caeoma Abietis-canadensis Farl. Proc. Am. Acad. Arts & Sci. **20**: 323. 1885.

On Pinaceae, O, I:

Tsuga canadensis (L.) Carr.

On Salicaceae, II, III:

Populus alba L.
Populus dilatata Ait.
Populus grandidentata Michx.
Populus tremuloides Michx.

Common in Pennsylvania;—northeastern United States.

Of the two poplar rusts occurring in Pennsylvania this species seems to be more common. It can be distinguished from *M. Medusae*, on poplar, by the size and shape of the urediniospores. The spores of *M. Abietis-canadensis* are small, globoid, and measure 13-18x 18-24 μ; those of *M. Medusae* are larger, more ellipsoid, and measure 16-23x26-35 μ.

26. Melampsora Bigelowii Thüm. Mitth. Forstl. Vers. Oest. **2**: 37. 1879.

Uredo Bigelowii Arth. Result. Sci. Congr. Bot. Vienne 338. 1906.

On Salicaceae II, III:

Salix lucida Muhl.
Salix nigra Marsh.
Salix pentandra L.

Not uncommon in Pennsylvania;—throughout the United States.

The pycnia and aecia of this species are known to occur on *Larix* sp. but have not been found in Pennsylvania. Several collections of the uredinial stage on one and two year old stems of willow, showing evidence of being perennial, indicate that the fungus may persist on the willow in the absence of the aecial host.

27. Melampsora Euphorbiae (Schubert) Cast. Obs. Myc. **2**: 18. 1843.

Xyloma Euphorbiae Schubert in Ficinus, Fl. Dresd. ed 2. **2**: 310. 1823.

On Euphorbiaceae, O, I, II, III:

Tithymalus Cyparissias (L.) Hill.

Apparently rare in Pennsylvania;—local in eastern and central United States.

Represented in Pennsylvania by a single collection from Centre County.

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[1]Key to the aecia on leaves of Tsuga Canadensis

Aecia amphigenous, or on young stems or cones, without peridium, Melampsora Abietis-Canadensis

Aecia hypophyllous only, in 2 rows, with cylindric peridium

Aeciospores verrucose with an elongate smooth spot ..Pucciniastrum Hydrangiae

Aeciospores finely and evenly verrucose .....Pucciniastrum Myrtilli

28. Melampsora Humboltiana Speg. An. Mus. Nac. Buenos Aires **23:** 28. 1912.

On Pinaceae, O, I:

Abies balsamea (L.) Mill.[8]

On Salicaceae, II, III:

Salix alba L.

Salix cordata Muhl.

Salix fragilis L.

Salix nigra Marsh.

**Salix purpurea* L.

Common in Pennsylvania;—northern United States, local in the southern United States.

Of the two willow rusts known in Pennsylvania, this is the more common species. It can be distinguished by the urediniospores which are 13-16x15-29 μ with finely verrucose walls not over 2 μ thick, while those of *M. Bigelowii* are larger, 15-19x17-24 μ with sparsely verrucose walls 3-5 μ thick.

29. Melampsora Medusae Thüm. Bull. Torrey Club **6:** 216. 1878.

Uredo Medusae Arth. Result. Sci. Congr. Bot. Vienne 338. 1906.

On Salicaceae, II, III:

Populus candicans Ait.

Populus tremuloides Michx.

Rare in Pennsylvania;—throughout the United States.

The pycnia and aecia are known to occur on Larix. Although Larix occurs in the vicinity where some of our collections were made, no aecia have been observed on these or elsewhere in Pennsylvania.

Family Pucciniaceae

10. CEROTELIUM Arth. Bull. Torrey Club. **33:** 30. 1906.

Cycle of development includes pycnia, aecia, uredinia and telia, with distinct alternating phases; heteroecious; telia waxy, teliospores catenulate; uredinia erumpent, peridium delicate; aecia cupulate.

30. Cerotelium Dicentrae (Trel.) Mains & And.; Mains, Am. Jour. Bot. **8:** 445. 1921.

Aecidium Dicentrae Trel. Trans. Wis. Acad. **6:** 136. 1884.

On Fumariaceae, O, I:

Bicuculla Cucullaria (L.) Millsp.

A single Pennsylvania collection from Lancaster county;—central and northeastern United States.

Uredinia and telia on *Urticastrum* sp. have been collected only in the middle west.

11. TRANZSCHELIA Arth. Result. Sci. Congr. Bot. Vienne 340. 1906.

Cycle of development, when complete, includes pycnia, aecia, uredinia and telia with distinct alternating phases; autoecious or heteroecious; aecia, when

[8]These aecia might be confused with those of *Calyptospora columnaris*, also on leaves of *A. balsamea* but can be distinguished since they are scattered, oval or oblong, early naked and pulverulent, and lack a peridium, while those of *C. columnaris* are in two rows, cylindrical, have a definite peridium, dehiscent at the apex.

present, aecidioid; teliospores forming heads by being attached by short pedicels to an inconspicuous common stalk.

31. Tranzschelia fusca (Pers.) Kern & Thurston, comb. nov.

Aecidium fuscum Pers. in Gmel. Syst. Nat. **2:** 1473. 1791.
Puccinia Anemones Pers. Obs. **2:** 24. 1799.
Polythelis fusca Arth. Result. Sci. Congr. Bot. Vienne 341. 1906.
On Ranunculaceae, O, III:
Anemone quinquefolia L.
Common in Pennsylvania;—northeastern United States.

Infection is perennial, causing the leaves to become erect and to mature early. It is not uncommon to find the aecia of *Tranzschelia punctata* on the same leaves.

32. Tranzschelia punctata (Pers.) Arth. Result. Sci. Congr. Bot. Vienne 340. 1906.

Aecidium punctatum Pers. Ann. Bot. Usteri. **20:** 135. 1796.
Puccinia Pruni-spinosae Pers. Syn. Fung. 226. 1801.
On Ranunculaceae, O, I:
Anemone quinquefolia L.
**Hepatica acuta* (Pursh.) Britton.
Hepatica Hepatica (L.) Karst.
**Thalictrum dioicum* L.
On Amygdalaceae, II, III:
Padus serotina (Ehrh.) Ag.
Fairly common Pennsylvania;—throughout the United States.

In Pennsylvania the stages on Anemone and Hepatica are the most common. On these hosts the infection is perennial; the infected leaves are small and appear early on very upright petioles.

33. Tranzschelia Thalictri (Chev.) Kern & Thurston, comb. nov.

Puccinia Thalictri Chev. Fl. Paris **1:** 417. 1826.
Polythelis Thalictri Arth. Result. Sci. Congr. Bot. Vienne 341. 1906.
On Ranunculaceae, O, III:
Thalictrum dioicum L.
**Thalictrum polygamum* Muhl.
Not common in Pennsylvania;—northern United States.

12. GYMNOCONIA Lagerh. Tromsö Mus. Aarsh. **16:** 140. 1894.

Cycle of development, when complete, includes pycnia, aecia and telia; autoecious; aecia erumpent, indefinite, without peridia or paraphyses; teliospores, when present, pedicellate, two-celled, with colored walls.

34. Gymnoconia interstitialis (Schlect.) Lagerh. Tromsö Mus. Aarsh. **16:** 140. 1894.

Caeoma (Uredo) interstitiale Schlect. Horae Phys. Berol. 96. 1820.
On Rosaceae, O, I, III:
Rubus canadensis L.
Rubus occidentalis L.
Rubus sp. (Raspberry cult.).
Common in Pennsylvania;—northeastern United States.

This rust and the short cycle species immediately following are often quite destructive in the state. On *Rubus occidentalis* only the long cycle form is known. (Kunkel, Jour. Ag. Res. 19: 501-512. 1920; Dodge Phytopath. **13:** 61-74. 1923).

35. Gymnoconia nitens (Schw.) Kern & Thurston, comb. nov.

Aecidium nitens Schw. Schr. Nat. Ges. Leipzig **1:** 69. 1822.
Kunkelia nitens Arth. Bot. Gaz. **63:** 504. 1917.
On Rosaceae, O, I:
Rubus allegheniensis Porter.
Rubus hispidus L.
Rubus villosus Ait. (*R. procumbens* Muhl.).
Common in Pennsylvania;—eastern and southern United States and on the Pacific coast.

The aeciospores of this species upon germination form a typical basidium and basidiospores. This method of germination provides the best means of distinguishing the short cycle species from *G. interstitialis*, the aeciospores of which germinate in the normal manner with a simple germ tube.

13. KUEHNEOLA Magn. Bot. Centr. **74:** 169. 1898.

Cycle of development when complete includes pycnia, aecia (primary uredinia), uredinia, and telia; autoecious; telia erumpent, teliospores free, in chains of 4-12 cells.

36. Kuehneola Uredinis (Link) Arth. N. Am. Fl. **7:** 186. 1912.

Oidium Uredinis Link, in Willd. Sp. Pl. **6**[2]: 123. 1824.
Phragmidium albidum Lagerh. Mitth. Bad. Bot. Ver. **1888:** 44. 1888.
On Rosaceae, O, II, III:
Rubus allegheniensis Porter.
Rubus frondosus Bigel.
Rubus hispidus L.
Rubus idaeus L.
Rubus villosus Ait. (*R. procumbens* Muhl.).
Common in Pennsylvania;—eastern United States.

This species is not so conspicuous as the two "orange rusts" of brambles. The telia appear as pale or whitish sori on the under surface of the leaves.

14. FROMMEA Arth. Bull. Torr. Club. **44:** 503. 1917.

Cycle of development includes pycnia, aecia (primary uredinia), uredinia, and telia with indistinct alternating phases; autoecious; telia erumpent, teliospores usually several-celled by transverse septa, rarely one-celled.

37. Frommea obtusa (Strauss) Arth. Bull. Torrey Club **44:** 503. 1917.

Uredo obtusa Strauss Ann. Wett. Ges. **2:** 107. 1810.
Phragmidium Potentillae-canadensis Diet. Hedwigia Beibl. **42:** 179. 1903.
Kuehneola obtusa Arth. N. Am. Fl. **7:** 185. 1912.
On Rosaceae, O, I, II, III:
Potentilla canadensis L.
Very common in Pennsylvania;—eastern United States.

15. PHRAGMIDIUM Link Ges. Nat. Freunde Berlin Mag. **7**: 30. 1815.

Cycle of development, when complete, includes pycnia, aecia, uredinia, and telia, with distinct alternating phases; autoecious; aecia erumpent indefinite, without peridium; uredinia, when present erumpent, definite; telia often arising at first from uredinia; teliospores two to several-celled, the wall dark colored.

38. Phragmidium disciflorum (Tode) J. F. James. Contr. U. S. Nat. Herb. **3**: 276. 1895.

Ascophora disciflorum Tode, Fungi. Meckl. **1**: 16. 1790.
Phragmidium mucronatum Schlecht. Fl. Berol. **2**: 156. 1824.
On Rosaceae, O, I, II, III:
Rosa sp.

Known in Pennsylvania by a single collection from Pike county;—throughout the United States.

Probably not as rare in this state as indicated above.

39. Phragmidium Potentillae (Pers.) P. Karst. Bidr. Finl. Nat. Folk **31**: 49. 1879.

Puccinia Potentillae Pers. Syn. Fung. 229. 1801.
On Rosaceae, O, I, II, III:
Potentilla monspeliensis L.

Rare in Pennsylvania;—northeastern United States and plains east of the Rocky Mountains.

In Pennsylvania a single collection of this rust is reported from Centre county.

40. Phragmidium speciosum (Fries.) Cooke, Grevillea **3**: 171. 1875.

Aregma speciosa Fries. Syst. Myc. **3**: 496. 1832.
Earlea speciosa Arth. Result. Sci. Congr. Bot. Vienne 341. 1906.
On Rosaceae, O, I, III:
Rosa carolina L.
Rosa chinensis Jacq.
Rosa virginiana Mill.
Rosa sp.—cult.

Fairly common in Pennsylvania;—throughout the United States.

This is a conspicuous rust. The aecia are orange in color and appear on the leaves and petioles which are often considerably distorted. The telial pustules are rather large, black and powdery and are confined to the stems.

16. TRIPHRAGMIUM Link. in Willd. sp. Pl. **6**[2]: 84. 1825.

Cycle of development, when complete, includes pycnia, aecia (primary uredinia) uredinia, and telia; autoecious; telia erumpent, teliospores free, triangularly three-celled.

41. Triphragmium clavellosum Berk. Gard. Chron. **1857**: 21. 1857.

Nyssopsora clavellosa Arth. N. Am. Fl. **7**: 180. 1912.
On Araliaceae, III:
Aralia nudicaulis L.

The only collection known in Pennsylvania is that reported by Herbst (Fung. Flora Lehigh Valley 177. 1899);—northeastern United States.

Teliospores are the only spore form known for this species.

17. PILEOLARIA Cast. Obs. 1: 22. 1842.

Cycle of development includes pycnia, aecia (primary uredinia), uredinia, and telia, with more or less evident alternating phases; telia erumpent, teliospores one-celled, free, flattened above and below.

42. Pileolaria Toxicodendri (Berk. & Rav.) Arth. N. Am. Fl. **7**: 147. 1912.

Uromyces Toxicodendri Berk. & Rav. Grevillea **3**: 46. 1874.

On Spondiaceae, O, I[II], II, III:

Toxicodendron radicans (L) Kuntze, *(Rhus radicans L.)*.

Fairly common in Pennsylvania;—throughout the United States.

18. RAVENELIA Berk. Gard. Chron. 1853: 132. 1853.

Cycle of development, when complete, includes pycnia, aecia (primary uredinia), uredinia, and telia, with more or less distinct alternating phases; telia erumpent, teliospores fascicled, forming compound heads, bordered by hyaline cysts.

43. Ravenelia epiphylla (Schw.) Dietel, Hedwigia **33**: 27. 1894.

Sphaeria epiphylla Schw. Schr. Nat. Ges. Leipzig **1**: 40. 1822.

On Fabaceae, O, I[II], II, III:

Cracca virginiana L.

Rare in Pennsylvania;—central and southern United States.

A single collection of this rust is from Centre county.

19. GYMNOSPORANGIUM[9] Hedw. f.; DC. Fl. Fr. **2**: 216. 1805.

Cycle of development includes pycnia, aecia, (rarely uredinia), and telia, with distinct alternating phases; heteroecious; aecia chiefly roestelioid, aeciospores with colored walls and evident germ-pores, telia gelatinous at maturity, teliospores chiefly 2-celled, sometimes 3-5-celled, with long hyaline pedicels.

44. Gymnosporangium Botryapites (Schw.) Kern, Bull. Torrey Club **35**: 506. 1908.

Cacoma (Roestelia) Botryapites Schw. Trans. Am. Phil. Soc. II. **4**: 294. 1832.

On Malaceae, O, I:

Amelanchier canadensis (L.) Medic.

Rare in Pennsylvania;—northeastern Atlantic Coast states.

Known in Pennsylvania from a single collection by Schweinitz (No. 2902). The telia of this rust are known to occur on *Chamaecyparis thyoides* L. but have not been collected in Pennsylvania.

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[9]Key to Pennsylvania species of Gymnosporangium on Juniperus virginiana

Telia causing fascination or witches' brooms of woody twigs and branches G. Nidus-avis

Telia causing gradually fusiform swellings on twigs or branches

Telia hemisphaerical, small ..... G. Germinale

Telia wedge shaped, large ..... G. effusum

Telia appearing on globoid galls

Telia thick, wedge shaped ..... G. globosum

Telia cylindrical ..... G. Juniperi-virginianae

45. Gymnosporangium clavariaeforme (Jacq.) DC. Fl. Fr. **2**: 217. 1805.

Tremella clavariaeforme Jacq. Coll. **2**: 174. 1788.

On Juniperaceae, III:

Juniperus communis L.

Rare in Pennsylvania;—northeastern and middle western United States.

A single collection from Pennsylvania is that of Schweinitz (No. 3095). The pycnia and aecia are known to occur on the fruit, leaves and stems of *Amelanchier* sp., *Aronia* sp., and *Cydonia vulgaris*, and are common in parts of New England.

46. Gymnosporangium effusum Kern. Bull. N. Y. Bot. Gard. **7**: 459. 1911.

On Juniperaceae, III:

Juniperus virginiana L.

Rare in Pennsylvania;—northern Atlantic Coast states.

This rust has been cultured on Aronia sp. but aecia have not been found in nature. In Pennsylvania a single collection of the telial stage has been made in Monroe county.

47. Gymnosprangium germinale (Schw.) Kern. Bull. Torrey Club. **35**: 506. 1908.

Caeoma (Peridermium) germinale Schw. Trans. Am. Phil. Soc. II. **4**: 294. 1832.

Gymnosporangium clavipes Cooke & Peck; Peck, Ann. Rep. N. Y. State Mus. **25**: 89. 1873.

On Malaceae, O, I:

Crataegus coccinea L.
Crataegus coccinoides Ashe
Crataegus Crus-galli L.
Crataegus cuneiformis (Marsh.) Eggleston
Crataegus Jesupi Sarg.
Crataegus macrosperma Ashe
Crataegus Margaretta Ashe
Crataegus neofluvialis Ashe
Crataegus pruinosa (Wendle) C. Koch
Crataegus punctata Jacq.
Crataegus straminea Beadle
Cydonia vulgaris (L) Pers.

On Juniperaceae, III:

Juniperus virginiana L.

Common in Pennsylvania;—eastern and middle western United States.

The aecial stage attacks principally the fruits of quince and hawthorns, at times distorting or killing buds and young stems. In some parts of the state considerable loss has been experienced by quince growers. In Nova Scotia, Massachusetts, and New York this rust has been reported as fairly common on apple fruits (see Hockey, J. F., Report of the Dominion Botanist for 1925, p. 38, 1926, for 1926, p. 35, 1927, and Thomas & Mills, Memoir 123, Cornell Univ. Agr. Exp. Sta. 1929). Without doubt some of the rust on apple fruits in Pennsylvania previously passing as *Gym. Juniperi-virginianae* should be referred to this species. The telia are found on slightly fusiform swellings

on the branches or trunks of the red cedar. On this host the rust is perennial, and at times quite injurious to young trees.

48. Gymnosporangium globosum Farl. Gymnosp. U. S. 34. 1880.

On Malaceae, O, I:
Crataegus Calpodendron (Ehrh.) Medic.
Crataegus coccinea L.
Crataegus coccinoides Ashe
Crataegus Crus-galli L.
Crataegus Jesupi Sarg.
Crataegus macrosperma Ashe
Crataegus Margaretta Ashe
Crataegus neofluvialis Ashe
Crataegus pruinosa (Wendle) C. Koch.
Crataegus punctata Jacq.
**Crataegus Schweinitziana* Sarg.
Crataegus straminea Beadle
Crataegus succulenta Schrad.
Pyrus communis L.
On Juniperaceae, III:
Juniperus virginiana L.

Common in Pennsylvania;—eastern and central United States.

The aecia of this rust are found commonly on the leaves of hawthorn. In New England they are common also on leaves of apple and pear. The telia are produced on a gall which somewhat resembles the more common apple-cedar gall. The sori, however, are wedge- or tongue-shaped and the mycelium is perennial (see Key).

49. Gymnosporangium Juniperi-virginianae Schw. Schr. Nat. Ges. Leipsig **1**: 74. 1822.

Gymnosporangium macropus Link, in Willd. Sp. Pl. 6^2: 128. 1825.
On Malaceae, O, I:
Malus coronaria (L) Mill.
Malus glaucescens Rehder
Malus Malus (L) Britton
On Juniperaceae, III:
Juniperus virginiana L.

Very common in Pennsylvania;—eastern, central, and southern United States.

This rust has been reported on apple from forty counties in Pennsylvania. As a destructive parasite of apple it is most severe in the southeastern section of the state. The loss to the apple crop has averaged about .5% or approximately 100,000 bushels per year for the past 20 years. Varieties of apples show considerable variation in their susceptibility. Eradication of the cedars seems to offer the best results in controlling this disease.

50. Gymnosporangium Nidus-avis Thaxter, Bull. Conn. Exp. Sta. 107: 3. 1891.

On Malaceae, O, I:
**Amelanchier canadensis* (L.) Medic.
**Amelanchier intermedia* Spach.

On Juniperaceae, III:

Juniperus virginiana L.

Rare in Pennsylvania;—eastern and central United States.

The telial stage of this rust is perennial on the red cedar and often causes conspicuous witches' brooms.

51. Gymnosporangium trachysorum Kern; Arth. Mycologia **2**: 237. 1910.

On Malaceae, O, I:

**Crataegus monogyna* Jacq.

Rare in Pennsylvania;—southeastern United States.

Known in Pennsylvania from the single collection of Schweinitz (No. 2899). The telia are known to occur on *Juniperus virginiana*, in South Carolina and Mississippi.

20. UROMYCES. Unger. Exanth. Pfl. 277. 1833.

Cycle of development, when complete, includes pycnia, aecia, uredinia, and telia, with distinct alternating phases; heteroecious or autoecious; aecia, when present, of the aecidioid type; uredinia, when present, erumpent, without a peridium, urediniospores borne singly on pedicels, the wall echinulate or verrucose; teliospores pedicelled, one-celled, with colored walls.

52. Uromyces appendiculatus (Pers.) Fries, Summa Veg. Scand. 514. 1849.

Uredo appendiculata Pers. Ann. Bot. Usteri **15**: 16. 1795.

Uromyces Phaseoli Wint. in Rab. Krypt. Fl. 1^1: 157. 1881.

Nigredo appendiculata Arth. Result. Sci. Congr. Bot. Vienne 343. 1906.

On Fabaceae, O, I, II, III:

Phaseolus lunatus L.

Phaseolus vulgaris L.

**Strophostyles umbellata* (Muhl.) Britton

Common in Pennsylvania;—eastern United States.

This rust is prevalent throughout the state, and often very injurious on both leaves and pods of many varieties of garden beans. The uredinia and telia are the stages commonly found.

53. Uromyces Asclepiadis (Schw.) Cooke, Grevillea **5**: 152. 1877.

Uredo Asclepiadis Schw.; Berk. & Curt. Journ. Acad. Phila. II. **2**: 282. 1853.

Uromyces Howei Peck, Ann. Rep. N. Y. State Mus. **30**: 75. 1879.

Nigredo Howei Arth. N. Am. Fl. **7**: 264. 1912.

On Asclepiadaceae, II, III:

Asclepias incarnata L.

Asclepias syriaca L.

Common in Pennsylvania;—northeastern United States and locally in the southern United States.

The pyncia and aecia of this form are unknown.

54. Uromyces Caladii (Schw.) Farl. Ellis, N. Am. Fungi 232. 1879.

Aecidium Caladii Schw. Schr. Nat. Ges. Leipzig **1**: 69. 1822.

Nigredo Caladii Arth. Result. Sci. Congr. Bot. Vienne 343. 1906.

On Araceae, O, I, II, III:

Arisaema Stewardsonii Britton

Arisaema triphyllum (L.) Schott.

Muricauda Dracontium (L.) Small
Peltandra virginica (L.) Kunth
Common in Pennsylvania;—throughout the eastern United States.

55. **Uromyces caryophyllinus** (Schrank) Wint. in Rab. Krypt. Fl.1[1]: 149. 1881.

Lycoperdon caryophyllinum Shrank, Baier, Fl. **2**: 668. 1789.
Nigredo caryophyllina Arth. N. Am. Fl. **7**: 246. 1912.
On Caryophyllaceae, II, III:
Dianthus caryophyllus L.
Common in Pennsylvania;—throughout the United States.

This rust is often very destructive on greenhouse carnations. The aecia occur on a European species of Euphorbia and are not known in this country.

56. **Uromyces Fabae** (Pers.) DeBary, Ann. Sci. Nat. IV. **20**: 80. 1863.

Uredo Fabae Pers. Neues Mag. Bot. **1**: 93. 1794.
Nigredo Fabae Arth. N. Am. Fl.**7**: 251. 1912.
On Fabaceae, O, I, II, III:
**Vicia Faba* L.
Rare in Pennsylvania;—throughout the United States.

In the United States this is principally a western species. The only collection known from Pennsylvania is that of Schweinitz (2943).

57. **Uromyces fallens** (Desmaz.) Kern, Phytopathology **1**: 6. 1911.

Uredo fallens Desmaz, Pl. Crypt. 1325. 1843.
Nigredo fallens Arth. N. Am. Fl. **7**: 254. 1912.
On Fabaceae, O, I, II, III:
Trifolium pratense L.
Common in Pennsylvania;—eastern United States.

The aecial stage of this rust is apparently rare and has not been collected in Pennsylvania. The rust in the aecial stage was first reported in this country by Hoffer (Proc. Ind. Acad. Sc. 1916).

58. **Uromyces Hedysari-paniculati** (Schw.) Farl. Ellis, N. Am. Fungi 246. 1879.

Puccinia Hedysari-paniculati Schw. Schr. Nat. Ges. Leipsig **1**: 74. 1822.
Nigredo Hedysari-paniculati Arth. Result. Sci. Congr. Bot. Vienne 343. 1906.
On Fabaceae, O, I, II, III:
Meibomia Dillenii (Darl.) Kuntze
Meibomia laevigata (Nutt.) Kuntze
Meibomia marilandica (L.) Kuntze
Meibomia obtusa (Muhl.) Vail
Meibomia paniculata (L.) Kuntze
Fairly common in Pennsylvania;—eastern United States.

59. **Uromyces houstoniatus** (Schw.) J. Sheldon, Torreya **9**: 55. 1909.

Caeoma (Aecidium) houstoniatum Schw. Trans. Am. Phil. Soc. II. **4**: 293. 1832.
Nigredo houstoniata J. Sheldon, Torreya **9**: 55. 1909.

On Rubiaceae, O, I:

Houstonia caerulea L.

Houstonia longifolia Gaertn.

Not uncommon in Pennsylvania;—principally an Atlantic Coast species.

Sheldon (Mycol. **1:** 237. 1908) has shown that the uredinia and telia occur on Sisyrinchium. These stages, while doubtless occurring in Pennsylvania, do not appear in our collections.

60. Uromyces Hyperici-frondosi (Schw.) Arth. Bull. Minn. Acad. Nat. Sci. **2**[2]: 15. 1883.

Aecidium Hyperici-frondosi Schw. Schr. Nat. Ges. Leipzig **1:** 68. 1822.

Nigredo Hyperici-frondosi Arth. Result. Sci. Congr. Bot. Vienne 344. 1906.

On Hypericaceae, O, I, II, III:

Hypericum boreale (Britton) Bickn.

**Hypericum majus* (A. Gray) Britton

Hypericum mutilum L.

Hypericum perforatum L.

**Hypericum prolificum* L.

Hypericum punctatum Lam.

Triadenum virginicum (L.) Raf.

Common in Pennsylvania;—eastern United States.

61. Uromyces Junci (Desmaz.) W. Trel. Ann. Sci. Nat. IV **2:** 146. 1854.

Puccinia Junci Desmaz. Pl. Crypt. 81. 1825.

Nigredo Junci Arth. N. Am. Fl. **7:** 238. 1912.

On Juncaceae, II & III:

**Juncus balticus* Willd.

Rare in Pennsylvania;—western United States.

The pycnia and aecia are known to occur on Circium.

62. Uromyces Junci-effusi Sydow, Monog. Ured. **2:** 290. 1910.

Nigredo Junci-effusi Arth. N. Am. Fl. **7:** 239. 1912.

On Juncaceae, II, III:

Juncus effusus L.

Common in Pennsylvania;—known throughout the northern United States.

The pycnia and aecia of this rust are unknown, although Jackson (Brooklyn Bot. Gard. Mem. **1:** 278. 1918) has suggested that field evidence indicates they should be looked for on Aster.

63. Uromyces Lespedezae-procumbentis (Schw.) M. A. Curt. Cat. Pl. N. Car. 123. 1867.

Puccinia Lespedezae-procumbentis Schw. Schr. Nat. Ges. Leipzig **1:** 73. 1822.

Nigredo Lespedezae-procumbentis Arth. Result. Sci. Congr. Bot. Vienne 344. 1906.

On Fabaceae, O, I, II, III:

Lespedeza capitata Michx.

Lespedeza frutescens (L.) Britton

Lespedeza hirta (L.) Hornem.

Lespedeza procumbens Michx.

Lespedeza Stuvei Nutt.

Lespedeza violacea (L.) Pers.

**Lespedeza virginica* (L.) Britton

Very common in Pennsylvania;—eastern United States.

64. Uromyces Medicaginis Pass.: Thüm. Herb. Myc. Oecon. 156. 1874.

Nigredo Medicaginis Arth. N. Am. Fl. **7**: 256. 1912.

On Fabaceae, II, III:

**Medicago lupulina* L.

Medicago sativa L.

Rare in Pennsylvania;—eastern, central, and southern United States.

A single collection of this rust is known from Centre county, Pennsylvania. The pycnia and aecia occur on Euphorbia sp. in Europe but are unknown in America.

65. Uromyces pedatatus (Schw.) J. Sheldon, Torreya **10**: 90. 1910.

Caeoma (Aecidium) pedatatum Schw. Trans. Am. Phil. Soc. II. **4**: 293. 1832.

Nigredo pedatata Arth. N. Am. Fl. **7**: 223. 1912.

On Violaceae, O, I:

**Viola pedata* L.

**Viola primulaefolia* L.

**Viola sagittata* L.

Known from Pennsylvania only by the collections of Schweinitz (Nos. 2884, 2885, 2886);—apparently common in the southeastern United States.

This is a heteroecious species with uredinia and telia on Andropogon sp. as shown by Sheldon (Torreya **9**: 55. 1909). These stages doubtless occur on this host in our state, but have not been reported. (See *Puccinia Ellisiana*).

66. Uromyces perigynius Halsted. Jour. Myc. **5**: 11. 1889.

Nigredo perigynia Arth. Result. Sci. Congr. Bot. Vienne 344. 1906.

On Carduaceae, O, I:

Rudbeckia laciniata L.

On Cyperaceae, II, III:

**Carex lanuginosa* Michx.

Carex scoparia Schkuhr.

Carex sp.

Not uncommon in Pennsylvania;—local in eastern and central United States.

67. Uromyces plumbarius Peck, Bot. Gaz. **4**: 127. 1879.

Uromyces Oenotherae Burrill, Bot. Gaz. **9**: 187. 1884.

Nigredo plumbaria Arth. Result. Sci. Congr. Bot. Vienne 344. 1906.

On Onagraceae, O, I, II, III:

Gaura biennis L.

Onagra biennis (L.) Scop. (*Oenothera biennis* L.).

Fairly common in Pennsylvania;—northern United States.

68. Uromyces Polygoni (Pers.) Fuckel, Jahrb. Nass. Ver. Nat. **23-24**: 64. 1870.

Puccinia Polygoni Pers. Neues Mag. Bot. **1**: 119. 1794.

Nigredo Polygoni Arth. Result. Sci. Congr. Bot. Vienne 344. 1906.

On Polygonaceae, O, I, II, III:

Persicaria punctata (Ell.) Small

Polygonum aviculare L.

Polygonum erectum L.

Common in Pennsylvania;—throughout the United States.

69. Uromyces Pontederiae W. Gerard, Bull. Torrey Club **6:** 31. 1875.

Nigredo Pontederiae Arth. N. Am. Fl. **7:** 238. 1912.

On Pontederiaceae, II, III:

Pontederia cordata L.

Rare in Pennsylvania;—Atlantic Coast states and Missouri.

Known in Pennsylvania from a single collection in Dauphin county; probably more widely distributed. The pycnia and aecia are unknown.

70. Uromyces proëminens (DC) Pass.; Rab. Fungi Eur. 1795. 1873.

Uredo proëminens DC. Fl. Fr. **2:** 235. 1805.

Uromyces Euphorbiae Cooke & Peck; Peck, Ann. Rep. N. Y. State Mus. **25:** 90. 1873.

Nigredo proëminens Arth. N. Am. Fl. **7:** 259. 1912.

On Euphorbiaceae, O, I, II, III:

**Chamaesyce humistrata* (Englm.) Small

**Chamaesyce hypericifolia* (L.) Millsp.

Chamaesyce maculata (L.) Small

Chamaesyce Preslii (Guss.) Arth.

Chamaesyce Rafinesqui (Greene) Small

Very common in Pennsylvania;—throughout the United States.

71. Uromyces Rhyncosporae Ellis, Jour. Myc. **7: 274.** 1893.

Nigredo Rhyncosporae Arth. Result. Sci. Congr. Bot. Vienne. 344. 1906.

On Cyperaceae, II, III:

Rynchospora glomerata (L.) Vahl.

Apparently rare in Pennsylvania;—eastern United States.

Known in Pennsylvania from a single collection in Cumberland county. The pycnia and aecia are unknown.

72. Uromyces Rudbeckiae Arth. & Holway; Arth. Bull. Iowa Agr. Coll. **1884:** 154. 1885.

Telospora Rudbeckiae Arth. Result. Sci. Congr. Bot. Vienne 346. 1906.

Teleutospora Rudbeckiae Arth. & Bisby; Arth. Bull. Torrey Club. **48:** 39. 1921.

On Carduaceae, III:

Rudbeckia laciniata L.

Not uncommon in Pennsylvania;—central, northeastern, and southwestern United States.

This is a short cycle species. Pycnia are not known.

73. Uromyces Scirpi (Cast.) Burrill, Bot. Gaz. **9:** 188. 1884.

Uredo Scirpi Cast. Cat. Pl. Mars. 214. 1845.

Nigredo Scirpi Arth. Result. Sci. Congr. Bot. Vienne 344. 1906.

On Ammiaceae, O, I:

Cicuta maculata L.

Apparently rare in Pennsylvania;—eastern United States and California.

Only one collection of this rust is known from Pennsylvania. The uredinia and telia which are known to occur on several species of Scirpus have not been recorded from this state.

74. Uromyces Silenes (Schlecht.) Fuckel, Jahrb. Nass. Ver. Nat. **23-24**: 61. 1870.

Aecidium Silenes Schlecht. Fl. Berol. **2**: 128. 1824.
Nigredo Silenes Arth. N. Am. Fl. **7**: 247. 1912.
On Caryophyllaceae, O, I, II, III:
Silene noctiflora L.
Rare in Pennsylvania;—local in northern United States.

Known from Pennsylvania from a single collection in Erie county.

75. Uromyces Silphii (Burrill) Arth. Jour. Myc. **13**: 202. 1907.

Aecidium compositarum Silphii Burrill; De-Toni, in Sacc. Syll. Fung. **7**: 789. 1888.
Nigredo Silphii Arth. N. Am. Fl. **7**: 239. 1912.
On Juncaceae, II, III:
**Juncus Dudleyi* Wiegand
Juncus tenuis Willd.
Fairly common in Pennsylvania;—known throughout the United States east of the Sierra Nevada and Cascade Mountains.

The aecial stage, shown by Arthur (Jour. Myc. **13**: 202. 1907) to occur on Silphium sp. has been collected only in the middle western states.

76. Uromyces Spermacoces (Schw.) M. A. Curt., Cat. Pl. N. Car. 123. 1867.

Puccinia Spermacoces Schw. Schr. Nat. Ges. Leipzig **1**: 74. 1822.
Nigredo Spermacoces Arth. N. Am. Fl. **7**: 266. 1912.
On Rubiaceae, O, I, II, III:
**Diodia teres* Walt.
Rare in Pennsylvania;—eastern and southern United States.

The Schweinitz collection (2840) is the only one recorded from Pennsylvania.

77. Uromyces Trifolii (Hedw. f.) Lev. Ann. Sci. Nat. III. **8**: 371. 1847.

Puccinia Trifolii Hedw. f.; DC. Fl. Fr. **2**: 225. 1805.
Nigredo Trifolii Arth. Result. Sci. Congr. Bot. Vienne 344. 1906.
Uromyces Hybridi W. H. Davis, Proc. Iowa Acad. Sci. **24**: 472. 1917.
On Fabaceae, O, I, II, III:
Trifolium hybridium L.
Trifolium repens L.
Common in Pennsylvania;—throughout the United States.

The aecial stage of this rust appears to be rare on T. hybridum but common on T. repens.

21. PUCCINIA Link. in Willd. Sp. Pl. 6^2: 67. 1825.

Cycle of development, when complete, includes pycnia, aecia, uredinia, and telia, with distinct alternating phases; heteroecious or autoecious; aecia, when present, aecidioid or uredinoid in some species; uredinia, when present, erumpent, without a peridium, urediniospores borne singly on pedicels, the walls echinulate or verrucose; teliospores pedicelled, two-celled, with colored walls.

78. Puccinia Acetosae (Schum.) Korn. Hedwigia **15**: 184. 1876.

Uredo Acetosae Schum. Enum. Pl. Saell. **2**: 231. 1803.
Dicaeoma Acetosae Kuntze. Rev. Gen. 3^3: 467. 1898.
On Polygonaceae, II, III:

Rumex Acetosella L.

Known in Pennsylvania from a single collection from Clinton county;—Atlantic coast states and locally in Indiana and Oregon.

Pycnia and aecia are unknown in this rust.

79. Puccinia Andropogi Schw. Trans. Am. Phil. Soc. II. **4**: 295. 1832.

Dicaeoma Andropogonis Kuntze, Rev. Gen. **3**[3]: 467. 1898.
Puccinia pustulata Arth. Journ. Myc. **10**: 18. 1904.
On Scrophulariaceae, O, I:
Chelone glabra L.
Pentstemon hirsutus (L.) Willd.
On Poaceae, II, III:
Andropogon scoparius Michx.
**Andropogon virginicus* L.

Fairly common in Pennsylvania;—throughout the United States except the Pacific coast.

Pycnia and aecia are known to occur also on *Commandra* sp. but have not been reported on this host from Pennsylvania. On *Andropogon virginicus* the only collection from Pennsylvania is that of Schweinitz No. 2915.

80. Puccinia Anemones-virginianae Schw. Schr. Nat. Ges. Leipzig **1**: 72. 1822.

Micropuccinia Anemones-virginianae Arth. & Jackson; Arth. Bull. Torrey Club **48**: 40. 1921.
On Ranunculaceae, III:
Anemone virginiana L.
Common in Pennsylvania;—northeastern United States.

81. Puccinia Angelicae (Schum.) Fuckel, Jahrb. Nass. Ver. Nat. **23-24**: 52. 1870.

Uredo Angelicae Schum. Enum. Pl. Saell. **2**: 233. 1803.
Bullaria bullata Arth. Result. Sci. Congr. Bot. Vienne 346. 1906.
On Ammiaceae, O, I, II, III:
Angelica villosa (Walt.) B. S. P.
Not common in Pennsylvania;—northern United States.

82. Puccinia angustata Peck, Bull. Buffalo Soc. Nat. Sci. **1**: 67. 1873.

Dicaeoma angustatum Kuntze, Rev. Gen. **3**[3]: 467. 1898.
On Lamiaceae, O, I:
Lycopus americanus Muhl.
Lycopus uniflorus Michx.
Lycopus virginicus L.
On Cyperaceae, II, III:
Scirpus atrovirens Muhl.
Scirpus cyperinus (L.) Kunth.
Common in Pennsylvania;—eastern and southwestern United States.

83. Puccinia anomala Rostr. Thüm. Flora. **61**: 92. 1878.

Puccinia simplex Erikss. & Henn. Zeits. Pflanzenkr. **4**: 260. 1894.
Dicaeoma anomalum Arth. & Fromme N. Am. Fl. **7**: 339. 1920.
On Poaceae, II, III:
Hordeum vulgare L.

Rather rare in Pennsylvania;—eastern and western United States.

The pycnia and aecia of this rust occur on *Ornithogalum* sp. but have been collected in this country only in Indiana. This appears to be the least common of the leaf rusts of cereals in Pennsylvania.

84. Puccinia Antirrhini Dietel & Holway; Dietel Hedwigia **37**: 269. 1897.

On Scrophulariaceae, II, III:

Antirrhinum majus L.

Common in Pennsylvania;—throughout the United States.

No pycnia and aecia are known. It is often of considerable economic importance both in the greenhouse and in the open.

85. Puccinia Arenariae (Shum.) Wint. in Rab. Krypt. Fl. **1**[1]: 167. 1881.

Uredo Arenariae Shum. Enum. Pl. Saell. **2**: 232. 1803.

Micropuccinia Arenariae Arth. & Jackson; Arth. Bull. Torrey Club **48**: 40. 1921.

On Caryophyllaceae, III:

**Dianthus barbatus* L.

Lychnis chalcedonica L. (Herbst)

Spergula arvensis L.

Apparently rare in Pennsylvania;—eastern, central, and northern United States.

86. Puccinia Asparagi DC. Fl. Fr. **2**: 595. 1805.

Dicaeoma Asparagi Kuntze, Rev. Gen. **3**[3]: 467. 1898.

On Convallariaceae, O, I, II, III:

Asparagus officinalis L.

Common in Pennsylvania;—throughout the United States.

We have collected this rust only in the uredinial and telial stages. It is a species of considerable economic importance and before the introduction of resistant varieties of asparagus was the cause of much loss to growers.

87. Puccinia Asperifolii (Pers.) Wettst. Verh. Zool. Bot. Ges. Wien. **35**: 541. 1886.

Accidium Asperifölii Pers. Obs. Myc. **1**: 97. 1796.

Puccinia rubigo-vera Wint. in Rab. Krypt. Fl. **1**[1]: 217. 1881.

Puccinia dispersa Eriksson Zeits. Pflanzenkr. **4**: 257. 1894.

Dicaeoma Asperifolii Kuntze, Rev. Gen. **3**[3]: 466. 1898.

On Poaceae, II, III:

Secale cereale L.

Common in Pennsylvania;—throughout the United States.

The pycnia and aecia of this rust occur on species of Lycopsis (Anchusa), but in this country have been found only on *L. capensis* in Indiana. (Myc. **1**: 236. 1909 and Myc. **8**: 133. 1916).

88. Puccinia Asteris Duby. Bot. Gall. **2**: 888. 1830.

Micropuccinia Asteris Arth. & Jackson; Arth. Bull. Torrey Club **48**: 40. 1921.

On Carduaceae, III:

Aster cordifolius L.

Aster divaricatus L.

**Aster ericoides* L.
**Aster Lowrieanus* Porter.
Aster macrophyllus L.
Aster paniculatus Lam.
Aster prenanthoides Muhl.
Aster radula Ait.
**Aster sagittifolius* Willd.
**Aster salicifolius* Lam.

Common in Pennsylvania;—throughout the United States.
Sometimes associated with the pycnia and aecia of *P. Asterum.*

89. Puccinia Asterum (Schw.) Kern, Mycologia **9**: 224. 1917.
Aecidium Asterum Schw. Schr. Nat. Ges. Leipzig **1**: 67. 1822.
Dicaeoma Asterum Arth. and Kern N. Am. Fl. **7**: 362. 1920.
On Carduaceae, O, I:
Aster cordifolius L.
Aster nemoralis Ait.
Aster prenanthoides Muhl.
Aster puniceus L.
Aster undulatus L.
Erigeron annuus (L.) Pers.
Erigeron pulchellus Michx.
Euthamia graminifolia (L.) Nutt.
Leptilon canadense (L.) Britton
Solidago altissima L.
Solidago caesia L.
Solidago canadensis L.
Solidago patula Muhl.
Solidago rugosa Mill.
Solidago serotina Ait.
On Cyperaceae, II, III:
Carex Muhlenbergii Schkuhr.
Carex pennsylvanica Lam.
Carex scoparia Schkuhr.
**Carex tenera* Dewey
Carex tribuloides Wahl.
Carex vulpinoidea Michx.
Dulichium arundinaceum (L.) Britton

Common in Pennsylvania;—throughout the United States, especially in the northern part.

90. Puccinia atropuncta Peck and Clinton; Peck, Bot. Gaz. **4**: 171. 1879.
Dicaeoma atropunctum Kuntze, Rev. Gen. **3**[3]: 468. 1898.
On Cichoriaceae, O, I:
Nabalus trifoliolatus Cass.
On Melanthaceae, II, III:
Chrosperma muscaetoxicum (Walt.) Kuntze.

Probably not uncommon in Pennsylvania;—eastern United States.

These aecia on Nabalus can be distinguished from those of *P. orbicula* on the same host by the somewhat smaller and rounder spores, and by the presence of a peridium which is lacking in the later species.

91. Puccinia Bardanae Corda. Ic. Fung. **4**: 17. 1840.

Bullaria Bardanae Arth. Result. Sci. Congr. Bot. Vienne 346. 1906.

On Carduaceae, O, I, II, III:

Arctium minus Schlect.

Common in Pennsylvania;—northeastern United States.

This has been considered a rare species in this country but is common in this region. It is not conspicuous and may easily be overlooked.

92. Puccinia Calthae (Grev.) Link, in Willd. Sp. Pl. 6^2: 79. 1825.

Aecidium Calthae Grev. Fl. Edin. 446. 1824.

Dicaeoma Calthae Kuntze, Rev. Gen. 3^3: 468. 1898.

On Ranunculaceae, O, I, II, III:

Caltha palustris L.

Rare in Pennsylvania;—eastern United States.

This species is here included on the basis of Herbst's report ("Fungal Flora of the Lehigh Valley," 1899) where it is listed as *Aecidium Calthae* Grev. Since the species has been found in nearby localities in New Jersey and New York, and Herbst mentions the presence of aecia, his collection would appear to belong to this species.

93. Puccinia canaliculata (Schw.) Lagerh. Tromsö Mus. Aarsh. **17**: 51. 1894.

Sphaeria canaliculata Schw. Trans. Am. Phil. Soc. II. **4**: 209. 1832.

Dicaeoma canaliculatum Kuntze, Rev. Gen. 3^3: 466. 1898.

On Ambrosiaceae, O, I:

**Xanthium* sp.

On Cyperaceae II, III:

Cyperus esculentus L.

**Cyperus strigosus* L.

Probably fairly common in Pennsylvania;—eastern United States.

94. Puccinia Chrysamthemi Roze, Bull. Soc. Myc. Fr. **17**: 92. 1900.

On Carduaceae, II, III:

Chrysanthemum morifolium Ramat. (Cultivated).

Common in Pennsylvania;—throughout the United States.

In this country only the uredinia are known. In some seasons the rust is destructive. While it is more commonly found in greenhouses, we have observed it out-of-doors on the single, Anemone and Pom Pom varieties.

95. Puccinia Circaeae Pers. Neues Mag. Bot. **1**: 119. 1794.

Micropuccinia Circaeae Arth. & Jackson; Arth. Bull. Torrey Club **48**: 40. 1921.

On Onagraceae, III:

Circaea alpina L.

Circaea lutetiana L.

Common in Pennsylvania;—eastern, central, and northern United States.

96. Puccinia Cirsii Lasch.; Rab. Fungi Eur. 89. 1859.

Bullaria Cirsii Arth. Result. Sci. Congr. Bot. Vienne 346. 1906.

On Carduaceae, O, II, III:

**Cirsium altissimum* (L.) Spreng.
Cirsium odoratum (Muhl.) Britton

Apparently rare in Pennsylvania;—throughout the United States, especially in the western mountains.

97. Puccinia claytoniata (Schw.) Peck, Bull. N. Y. State Mus. **6**: 226. 1899.

Caeoma (Aecidium) claytoniatum Schw. Trans. Am. Phil. Soc. II. **4**: 294. 1832.
Allodus claytoniata Arth. Result. Sci. Congr. Bot. Vienne 345. 1906.
On Portulacaceae, O, I, III:
Claytonia virginica L.
Fairly common in Pennsylvania;—northern United States.

98. Puccinia Clematidis (DC) Lagerh. Tromsö. Mus. Aarsh. **17**: 47. 1895.

Aecidium Clematidis DC. Fl. Fr. **2**: 243. 1805.
Puccinia Agropyri E. & E. Jour. Myc. **7**: 131. 1892.
Puccinia triticina Eriksson, Ann. Sci. Nat. VIII. **9**: 270. 1899.
On Ranunculaceae, O, I:
Cimicifuga racemosa (L.) Nutt.
Clematis virginiana L.
**Thalictrum dioicum* L.
On Poaceae, II, III:
Agropyron repens (L.) Beauv.
Elymus canadensis L.
Triticum aestivum L.
Abundant in Pennsylvania;—throughout the United States.

The common leaf rust of wheat is abundant and often the cause of considerable loss in Pennsylvania. The uredinia and telia are more commonly found than are the aecia. This rust is known to occur on several other representatives of the two families mentioned, (N. Am. Fl. **7**: 333, 1920) and doubtless can be found on some of them in Pennsylvania which do not appear in our collections.

99. Puccinia Cnici H. Mart. Fl. Mosq. 226. 1817.

Dicaeoma Cnici Arth. Result. Sci. Congr. Bot. Vienne 344. 1906.
On Carduaceae, O, I, II, III:
Cirsium lanceolatum (L.) Hill.
Fairly common in Pennsylvania;—northern United States.

100. Puccinia Convolvuli (Pers.) Cast. Obs. **1**: 16. 1842.

Uredo Betae Convolvuli Pers. Syn. Fung. 221. 1801.
Dicaeoma Convolvuli Kuntze, Rev. Gen. **3**[3]: 468. 1898.
On Convolvulaceae, O, I, II, III:
Convolvulus sepium L.
Common in Pennsylvania;—eastern United States and the Pacific coast.

101. Puccinia Cryptotaeniae Peck. Bull. Buffalo Soc. Nat. Sci. **1**: 66. 1873.

Micropuccinia Cryptotaeniae Arth. & Jackson; Arth. Bull. Torrey Club **48**: 42. 1921.
On Ammiaceae, O, III:
Deringa canadensis (L.) Kuntze.
Not common in Pennsylvania;—northeastern United States.

102. Puccinia curtipes Howe, Bull. Torrey Club **5:** 3. 1874.

Micropuccinia curtipes Arth. & Jackson; Arth. Bull. Torrey Club **48:** 42. 1921.

On Saxifragaceae, III:

Micranthes virginiensis (Michx.) Small

Known in Pennsylvania from a single collection from Huntingdon county;—northern United States.

103. Puccinia Cyani (Schleich.) Pass.; Rab. Fungi Eur. 1767. 1873.

Uredo Cyani Schleich.; DC. Fl. Fr. **6:** 74. 1815.

Bullaria Cyani Arth. Result. Sci. Congr. Bot. Vienne 346. 1906.

On Carduaceae, II, III:

Centaurea Cyanus L.

Known in Pennsylvania from a single collection from Centre county.—central eastern United States.

104. Puccinia Cyperi Arth. Bot. Gaz. **16:** 226. 1891.

Dicaeoma Cyperi Kuntze, Rev. Gen. **3**[3]**:** 466. 1898.

On Cyperaceae, II, III:

Cyperus filiculmis Vahl.

Known in Pennsylvania from a single collection from Franklin county;—eastern and central United States.

The pycnia and aecia of this rust are unknown.

105. Puccinia Dayi G. W. Clinton; Peck, Ann. Rep. N. Y. State Mus. **28:** 60. 1876.

Micropuccinia Dayi Arth. & Jackson; Arth. Bull. Torrey Club. **48:** 40. 1921.

On Primulaceae, III:

Steironema ciliatum (L.) Raf.

Apparently not common in Pennsylvania;—northeastern United States.

106. Puccinia Eleocharidis Arth. Bull. Iowa Agr. Coll. Dep. Bot. **1884:** 156. 1884.

Dicaeoma Eleocharidis Kuntze, Rev. Gen. **3**[3]**:** 468. 1898.

On Carduaceae, O, I:

Eupatorium perfoliatum L.

Eupatorium purpureum L.

On Cyperaceae, II, III:

Eleocharis intermedia (Muhl.) Schultes.

**Eleocharis palustris* (L.) R. & S.

Not uncommon in Pennsylvania;—throughout the United States east of the Rocky Mountains.

107. Puccinia Ellisiana Thüm. Bull. Torrey Club **6:** 215. 1878.

Aecidium Marie-Wilsoni Peck Ann. Rep. N. Y. State Mus. **24:** 92. 1872.

Not *Puccinia Marie-Wilsoni* G. W. Clinton. 1873.

Dicaeoma Marie-Wilsoni Arthur & Fromme, N. Am. Fl. **7:** 280. 1920.

On Poaceae, II, III:

Andropogon scoparius Michx.

Southeastern Pennsylvania;—eastern United States.

Probably more abundant in the state than our collections indicate. **The**

pycnia and aecia are known to occur on several species of *Viola* throughout the northeastern United States, but apparently have never been recorded from Pennsylvania. In the aecial stage this rust is not easily distinguished from the autoecious *P. Violae*, but differs in having somewhat smaller spores and peridial cells. It is also indistinguishable from *Uromyces pedatatus* except for the possession of 2-celled teliospores.

108. Puccinia emaculata Schw. Trans. Am. Phil. Soc. II. **4**: 295. 1832.

Dicaeoma emaculatum Kuntze, Rev. Gen. **3**[3]: 468. 1898.

On Poaceae, II, III:

Panicum capillare L.

Common locally in Pennsylvania;—eastern and central United States.

The pycnia and aecia of this rust are unknown.

109. Puccinia epiphylla (L.) Wettst. Veehl. Zool.-Bot. Ges. Wein. **35**: 541. 1885.

Lycoperdon epiphyllum L. Sp. Pl. 1185. 1753.
Puccinia Poarum Nielsen, Bot. Tidsskr. III. **2**: 34. 1877.
Dicaeoma epiphyllum Kuntze, Rev. Gen. **3**[3]: 468. 1898.

On Poaceae, II, III:

Poa compressa L.
Poa pratensis L.

Common in Pennsylvania;—throughout the United States.

Commonly found only in the uredinial stage. The aecia are known to occur on *Tussilago* sp., but in America have been reported only from Alaska.

110. Puccinia Fraseri Arth. Bull. Torrey Club **42**: 591. 1915.

Micropuccinia Fraseri Arth. & Jackson. N. Am. Fl. **7**: 585. 1922.

On Cichoriaceae, III:

Hieracium paniculatum L.
Hieracium venosum L.

Fairly common in Pennsylvania;—northeastern United States.

111. Puccinia fraxinata (Link) Arth. Bot. Gaz. **34**: 6. 1902.

Caeoma fraxinata Link. in Willd. Sp. Pl. **6**[2]: 62. 1825.
Dicaeoma Fraxini Arth. Result. Sci. Congr. Bot. Vienne 344. 1906.

On Oleaceae, O, I:

Fraxinus americana L.
**Fraxinus pennsylvanica* Marsh.

Southeastern Pennsylvania;—eastern United States.

We have not seen specimens of the uredinia and telia from this state although the host on which they are known to occur (Spartina sp.) is known from the same localities as our collections of aecia.

112. Puccinia globosipes Peck, Bull. Torrey Club **12**: 34. 1885.

Bullaria globosipes H. S. Jackson, Proc. Ind. Acad. Sci. **1915**: 437. 1915.

On Solanaceae, II, III:

Lycium halimifolium Mill.

Known in Pennsylvania from a single collection from Bedford county;—southern United States.

113. Puccinia gnaphaliata (Schw.) Arth. & Bisby, Proc. Am. Phil. Soc. **57:** 221. 1918.

Caeoma (Aecidium) gnaphaliatum Schw. Trans. Am. Phil. Soc. II. **4:** 292 1832.

Allodus gnaphaliata Arth. Result. Sci. Congr. Bot. Vienne 345. 1906.

On Carduaceae, O, I, III:

**Gnaphalium obtusifolium* L.

Known in Pennsylvania only from the collections of Schweinitz (2873. 2932);—Atlantic and Pacific coasts of the United States.

114. Puccinia Grossulariae Schum. Lagerh. Tromsö Mus. Aarsh. **17:** 60. 1895.

Aecidium Grossulariae Shum. Enum. Pl. Saell. **2:** 223. 1803.

Dicaeoma Grossulariae Kern, Trans. Am. Micr. Soc. **32:** 64. 1913.

On Grossulariaceae, O, I:

Grossularia oxycanthoides (L.) Mill.

Grossularia rotundifolia (Michx.) Cov. and Britt.

On Cyperaceae, II, III:

Carex complanata Torr.

Carex crinita Lam.

Carex flexuosa Muhl.

Carex gracillima Schw.

Carex gynandra Schw.

**Carex oligocarpa* Schkuhr.

Carex prasina Wahl.

**Carex stricta* Lam.

Common in Pennsylvania;—northern United States.

115. Puccinia Helianthi-mollis (Schw.) H. S. Jackson, Brooklyn Bot. Gard. Mem. **1:** 250. 1918.

Aecidium Helianthi-mollis Schw. Schr. Nat. Ges. Leipzig **1:** 68. 1822.

Puccinia Helianthi Schw. Schr. Nat. Ges. Leipzig **1:** 73. 1822.

Dicaeoma Helianthi-mollis Arth. Result. Sci. Congr. Bot. Vienne 344. 1906.

On Carduaceae, O, I, II, III:

Helianthus annuus L.

**Helianthus decapetalus* L.

**Helianthus mollis* Lam.

Helianthus strumosus Lam.

**Helianthus tracheliifolius* Mill.

Helianthus tuberosus L.

**Heliopsis helianthoides* (L.) Sweet.

Common in Pennsylvania;—throughout the United States.

116. Puccinia Heucherae (Schw.) Dietel. Ber. Deuts. Bot. Ges. **9:** 42. 1891.

Uredo Heucherae Schw. Schr. Nat. Ges. Leipzig **1:** 71. 1822.

Micropuccinia Heucherae Arth. & Jackson; Arth. Bull. Torrey Club **48:** 41. 1921.

On Saxifragaceae, III:

Heuchera americana L.

Mitella diphylla L.
Tiarella cordifolia L.

Common in Pennsylvania;—throughout the United States.

117. Puccinia hibisciata (Schw.) Kellerm. Jour. Myc. **9:** 110. 1903.

Caeoma (Accidium) hibisciatum Schw. Trans. Am. Phil. Soc. II. **4:** 293. 1832.
Puccinia Epicampes Arth. Bull. Torrey Club **28:** 662. 1901.
Puccinia Muhlenbergiae Arth. & Holway Bull. Lab. Nat. Hist. Univ. Iowa. **5:** 317. 1902.
Dicaeoma hibisciatum Arth. Result. Sci. Congr. Bot. Vienne 344. 1906.
On Malvaceae, O, I:
Hibiscus militaris Cav.
On Poaceae, II, III:
**Muhlenbergia mexicana* (L.) Trin.
Muhlenbergia Schreberi Gmel.

Not common in Pennsylvania;—throughout the United States except the Pacific coast.

118. Puccinia hieraciata (Schw.) H. S. Jackson, Brooklyn Bot. Gard. Mem. **1:** 251. 1918.

Aecidium hieraciatum Schw. Trans. Am. Phil. Soc. II. **4:** 292. 1832.
Dicaeoma hieraciatum Arth. and Kern, N. Am. Fl. **7:** 366. 1920.
On Cichoriaceae, O, I:
Hieracium paniculatum L.

Known in Pennsylvania only by the single collection of Schweinitz (2868);—northern United States.

The uredinia and telia are known to occur on several species of Carex, but have never been recorded from Pennsylvania.

119. Puccinia Hieracii (Schum.) H. Mart. Fl. Mosq. 226. 1812.

Uredo Hieracii Schum. Enum. Pl. Saell. **2:** 232. 1803.
Puccinia Taraxaci Plowr. Brit. Ured. 186. 1889.
Bullaria Hieracii Arth. Result. Sci. Congr. Bot. Vienne 346. 1906.
On Cichoriaceae, O, I, II, III:
Cichorium intybus L.
Hieracium scabrum Michx.
Hieracium venosum L.
Leontodon Taraxacum L.

Common in Pennsylvania;—throughout the United States.

120. Puccinia Hydrophylli Peck & Clinton; Peck, Ann. Rep. N. Y. State Mus. **30:** 54. 1878.

Micropuccinia Hydrophylli Arth. & Jackson; Arth. Bull. Torrey Club. **48:** 42. 1921.
On Hydrophyllaceae, III:
Hydrophyllum virginianum L.

Known in Pennsylvania only from the report of W. Herbst;—northern United States.

121. Puccinia Hyssopi Schw. Trans. Am. Phil. Soc. II. **4:** 296. 1832.

Micropuccinia Hyssopi Arth. & Jackson; Arth. Bull. Torrey Club **48:** 42. 1921.

On Lamiaceae, III:

**Agastache scrophulariaefolia* (Willd.) Kuntze.

Known in Pennsylvania only from the collection of Schweinitz (2944);—eastern and central United States.

122. Puccinia Impatientis (Schw.) Arth. Bot. Gaz. **35:** 19. 1903.

Accidium Impatientis Schw. Schr. Nat. Ges. Leipzig **1:** 67. 1822.

Diceaoma Impatientis Arth. Proc. Ind. Acad. Sci. **1903:** 148. 1904

On Balsaminaceae, O, I:

Impatiens biflora Walt.

**Impatiens pallida* Nutt.

On Poaceae, II, III:

Agrostis perennans (Walt.) Tuckerm.

Elymus hirsutiglumis Scribn.

Elymus virginicus L.

Common in Pennsylvania;—eastern United States.

This is a very conspicuous rust on Impatiens, where it appears on the stems in the form of large fusiform swellings, and on the leaves as large yellow areas.

123. Puccinia Iridis (DC.) Rab. Deutschl. Krypt. Fl. **1:** 23. 1844.

Uredo Iridis DC.; Poir. in Lam. Encyc. **8:** 224. 1808.

Dicaeoma (?) *Iridis* Kuntze, Rev. Gen. **3**[3]: 469. 1898.

On Iridaceae, II, III:

Iris versicolor L.

Apparently rare in Pennsylvania;—nearly throughout the United States.

The pycnia and aecia of this rust are unknown, and east of the Rocky Mountains only the uredinia have been found. Our records show only two collections, one from Pike county and the other that of Schweinitz (2821).

124. Puccinia Lobeliae W. Gerard; Peck, Bull. Buffalo Soc. Nat. Sci. **1:** 66. 1873.

Micropuccinia Lobeliae Arth. & Jackson; Arth. Bull. Torrey Club **48:** 41. 1921.

On Lobeliaceae, III:

Lobelia syphilitica L.

Apparently rare in Pennsylvania;—eastern and central United States.

125. Puccinia lysimachiata (Link.) Kern, Mycologia **9:** 215. 1917.

Cacoma lysimachiatum Link, in Willd. Sp. Pl. **6**[2]: 45. 1825.

Dicaeoma Lysimachiae Kuntze, Rev. Gen. **3**[3]: 467. 1898.

On Primulaceae, O, I:

Lysimachia terrestris (L.) B. S. P.

Apparently rare in Pennsylvania;—northeastern United States.

But two collections of this rust are known from the state, the first, Schweinitz (2863) and the second from Sullivan county. The uredinia and telia are not recorded from Pennsylvania but are known to occur on *Carex* sp.

126. Puccinia maculosa Schw. Trans. Am. Phil. Soc. II. **4**: 295. 1832.

Micropuccinia maculosa Arth. & Jackson; Arth. Bull. Torrey Club **48**: 42. 1921.

On Cichoriaceae, III:

**Adopogon virginicus* (L.) Kuntze.

Known in Pennsylvania only from the collection of Schweinitz (2922);—northern United States.

127. Puccinia Majanthae (Schum.) Arth. & Holw. Bull. Lab. Nat. Hist. Univ. Iowa **5**: 188. 1901.

Arcidium Majanthae Schum. Enum. Pl. Saell. **2**: 224. 1803.

Dicaeoma Majanthae Arth. Proc. Ind. Acad. Sci. **1903**: 149. 1904.

On Convallariaceae, O, I:

Polygonatum sp. (Herbst)

Unifolium canadense (Desf.) Greene

Vagnera racemosa (L.) Morong.

Apparently rare in Pennsylvania;—eastern and central United States.

The uredinia and telia are known to occur on *Phalaris* sp.

128. Puccinia Malvaccarum Bertero; Mont. in C. Gay, Fl. Chil. **8**: 43. 1852.

Micropuccinia Malvaccarum Arth. & Jackson; Arth. Bull. Torrey Club. **48**: 41. 1921.

On Malvaceae, III:

Althaea rosea (L.) Cav.

Malva rotundifolia L.

Common in Pennsylvania;—throughout the United States.

On both hosts the infection appears to be perennial. The sori are conspicuous on the under surface of the leaves and often on the stems.

129. Puccinia marylandica Lindr. Medd. Stockh. Hogsk. Bot. Inst. **4**°: 2. 1901.

Dicaeoma marylandicum Arth. N. Am. Fl. **7**: 398. 1920.

On Ammiaceae, O, I, II, III:

Sanicula canadensis L.

Sanicula marylandica L.

Sanicula trifoliata Bicknell

Fairly common in Pennsylvania;—eastern and central United States.

130. Puccinia Menthae Pers. Syn. Fung. 227. 1801.

Dicaeoma Menthae S. F. Gray, Nat. Arr. Brit. Pl. **1**: 542. 1821.

On Lamiaceae, O, I, II, III:

Clinopodium vulgare L.

Cunila origanoides (L.) Britton

**Hedeoma puligioides* (L.) Pers.

Koellia flexuosa (Walt.) MacM.

Koellia incana (L.) Kuntze.

**Koellia mutica* (Michx.) Britton

**Koellia virginiana* (L.) MacM.

Mentha canadensis L.

Mentha gentilis L.

Mentha piperita L.

Mentha spicata L.
Monarda clinopodia L.
**Monarda didyma* L.
Monarda fistulosa L.
Teucrium candense L.

Very common in Pennsylvania;—throughout the United States except in the southeast.

In our collections pycnia and aecia have been found only on *Clinopodium vulgare, Cunila origanoides,* and *Mentha piperita.*

131. Puccinia microsora Körn.; Fuckel, Fungi Rhen. 2637. 1874.

Dicaeoma microsorum Kuntze, Rev. Gen. **3**[3]: 469. 1898.

On Cyperaceae, II, III:
Carex lurida Wahl.
Carex scabrata Schw.
**Carex Sprengelii* Dewey.

Not common in Pennsylvania;—in isolated localities of the Allegheny Mountains, and a few scattered localities west and south.

Our only collections are from Huntingdon county. The pycnia and aecia are unknown.

132. Puccinia Myosotidis (Burr.) Barth. Handb. N. Am. Ured. 141. 1928.

Aecidium Myosotidis Burr. Bot. Gaz. **9**: 189. 1884.
Dicaeoma Myosotidis N. Am. Fl. **7**: 780. 1926.

On Ranunculaceae, O, I:
Ranunculus abortivus L.

On Poaceae, II, III:
Sphenopholis pallens (Spreng.) Scrib.

Locally in Pennsylvania;—eastern and central United States.

133. Puccinia obscura Schroet. Pass. Nuovo Giorn. Bot. Ital. **9**: 256. 1877.

Dicaeoma obscurum Kuntze, Rev. Gen. **3**[3]: 469. 1898.

On Juncaceae, II, III:
Juncoides sp.

Known in Pennsylvania from a single collection from Centre county;—northern United States.

The pycnia and aecia are known to occur on *Bellis perennis* L. in Europe but have not been reported from the United States.

134. Puccinia Peckii (De-Toni) Kellerm. Jour. Myc. **8**: 20. 1902.

Aecidium Oenothereae Mont. in C. Gay, Fl. Chil. **8**: 37. 1852. Not Puccinia Oenotherae Vize.
Aecidium Peckii De-Toni, in Sacc. Syll. Fung. **7**: 790. 1888.
Dicaeoma Peckii Arth. Proc. Ind. Acad. Sci. **1903**: 149. 1904.

On Onagraceae, O, I:
Onagra biennis (L.) Scop.
Kneiffia fruticosa (L.) Raiman.

On Cyperaceae, II, III:
**Carex scabrata* Schw.
Carex sp.

Not common in Pennsylvania;—northern United States, especially in the middle west.

135. Puccinia Orbicula Peck and Clinton; Peck, Rep. N. Y. State Mus. **30**: 53. 1879.

Dicaeoma Orbicula Kuntze, Rev. Gen. **3**[3]: 469. 1898.

On Cichoriaceae, O, I, II, III:

Nabalus albus (L.) Hook.
Nabalus altissimus (L.) Hook.
Nabalus trifoliolatus Cass.

Apparently not common in Pennsylvania;—northeastern United States.

136. Puccinia Pammelii (Trel.) Arth. Jour. Myc. **11**: 56. 1905.

Aecidium Pammelii Trel. Fungi. Wis. 32. 1884: Trans. Wis. Acad. **6**: 136. 1885.

Dicaeoma Pammelii Arth. Proc. Ind. Acad. Sci. **1903**: 149. 1904.

On Poaceae, II, III:

Panicum virgatum L.

Known in Pennsylvania from a single collection from Lancaster county;—east of the Rocky Mountains.

The pycnia and aecia of this rust are known to occur on several members of the Euphorbiaceae in the middle western states.

137. Puccinia Pimpinellae (Strauss) H. Mart. Fl. Mosq. ed. 2. 226. 1817.

Uredo Pimpinellae Strauss, Ann. Wett. Ges. **2**: 102. 1810.

Dicaeoma Pimpinellae Kuntze, Rev. Gen. **3**[3]: 470. 1898.

On Ammiaceae, O, I, II, III:

**Chaerophyllum procumbens* (L.) Cranzt.
Osmorrhiza Claytoni (Michx.) Clarke.
Osmorrhiza longistylis (Torr.) DC.

Common in Pennsylvania;—throughout the United States except in the northernmost part.

138. Puccinia Poculiformis (Jacq.) Wettst. Verh. Zool. Bot. Ges. Wien. **35**: 544. 1886.

Lycoperdon poculiforme Jacq. Coll. **1**: 122. 1786.

Puccinia graminis Pers. Neues. Mag. Bot. **1**: 119. 1794.

Puccinia Phlei-pratensis Erikss & Henn. Zeits. Pflanzenk. **4**: 140. 1894.

Dicaeoma poculiforme Kuntze, Rev. Gen. **3**[3]: 466. 1898.

On Berberidaceae, O, I:

Berberis vulgaris L.

On Poaceae, II, III:

Agropyron repens (L.) Beauv.
Agrostis palustris Huds.
Agrostis perennans (Walt.) Tuckerm.
Avena sativa L.
Dactylis glomerata L.
Festuca elatior L.
Hordeum jubatum L.
Hordeum vulgare L.

Phleum pratense L.
Poa compressa L.
Secale cereale L.
Triticum aestivum L.

Common in Pennsylvania;—throughout the United States.

This is probably the most widely known of any of the rusts. In Pennsylvania it is serious only locally. Bad outbreaks on cereals have been traced in many instances to nearby barberry, which is well established as an escape from cultivation in certain sections of the state. (See Kern, Distribution of Berberis vulgaris in Pennsylvania, Bull. Torrey Club **48:** 263-269. 1921.) On the telial hosts there have been distinguished several specialized races of which the one on timothy is probably the most distinct.

139. Puccinia Podophylli Schw. Schr. Nat. Ges. Leipzig **1:** 72. 1822.

Allodus Podophylli Arth. Result. Sci. Congr. Bot. Vienne 345. 1906.

On Berberidaceae, O, I, III:
Podophyllum peltatum L.

Common in Pennsylvania;—eastern United States.

140. Puccinia Polygoni-amphibii Pers. Syn. Fung. 227. 1801.

Dicaeoma Polygoni-amphibii Arth. Proc. Ind. Acad. Sci. **1898:** 184. 1899.

On Geraniaceae, O, I:
**Geranium Bicknellii* Britton
Geranium maculatum L.

On Polygonoceae, II, III:
**Bilderdykia Convolvulus* (L.) Dumort.
**Bilderdykia cristata* (Engel. & Gray) Greene
Bilderdykia scandens (L.) Greene
Persicaria Hartwrightii (A. Gray) Greene
Persicaria hydropiperoides (Michx.) Small
**Persicaria Muhlenbergii* (Meissn.) Small
Persicaria pennsylvanica (L.) Small
**Persicaria Persicaria* (L.) Small
Tovara virginiana (L.) Raf.

Common in Pennsylvania;—throughout the United States.

The pycnia and aecia are apparently much more rare than the uredinia and telia.

141. Puccinia punctata Link, Ges. Nat. Freunde Berlin Mag. **7:** 30. 1815.

Diaceoma punctatum Arth. Proc. Ind. Acad. Sci. **1903:** 150. 1904.

On Rubiaceae, O, I, II, III:
Galium concinnum T. & G.

Known in Pennsylvania from a single collection from Cumberland county;—throughout the United States, but rare east of the Mississippi valley.

142. Puccinia recedens Sydow, Monog. Ured. **1:** 146. 1902.

Micropuccinia recedens Arth. & Jackson; Arth. Bull. Torrey Club. **48:** 41. 1921.

On Carduaceae, III:
Senecio aureus L.

Common in Pennsylvania;—northern and eastern United States.

143. Puccinia Rhamni (Pers.) Wetts. Verh. Zool.-Bot. Ges. Wien. **35**: 545. 1886.

Aecidium Rhamni Pers. in J. F. Gmel. Syst. Nat. **2**: 1472. 1791.
Puccinia coronata Corda Ic. Fung. **1**: 6. 1837.
Puccinia coronifera Kleb. Zeits. Pflanzenkrankr. **4**: 135. 1894.
On Rhamnaceae, O, I:
Rhamnus cathartica L.
On Poaceae, II, III:
Avena sativa L.
Festuca elatior L.
Notholcus lanatus (L.) Nash.
Common in Pennsylvania;—throughout the United States.

The leaf rust of oats is very abundant and often destructive throughout the state. The aecial stage has been rarely collected but is doubtless common especially in the northern part of the state.

144. Puccinia Ruelliae (Berk. & Br.) Lagerh. Tromsö. Mus. Aarsh. **17**: 71. 1895.

Uredo Ruelliae Berk. & Br. Jour. Linn. Soc. **14**: 92. 1873.
Dicaeoma Ruellaie Kuntze, Rev. Gen. **3**³: 470. 1898.
On Acanthaceae, O, I, II, III:
Ruellia strepens L.
Known in Pennsylvania from a single collection from Dauphin county;—central United States.

145. Puccinia Sambuci (Schw.) Arth. Bot. Gaz. **35**: 15. 1903.

Aecidium Sambuci Schw. Schr. Nat. Ges. Leipzig **1**: 67. 1822.
Dicaeoma Sambuci Arth. Proc. Ind. Acad. Sci. **1903**: 151. 1904.
On Caprifoliaceae, O, I:
Sambucus canadensis L.
On Cyperaceae, II, III:
Carex lurida Wahl.
Fairly common in Pennsylvania;—throughout the United States east of the Rocky Mountains.

The aecia on Sambucus are very conspicuous both on the leaves and on the young stems, where the infection causes a pronounced swelling and often much distortion.

146. Puccinia Silphii Schw. Trans. Am. Phil. Soc. II. **4**: 296. 1832.

Micropuccinia Silphii Arth. & Jackson; Arth. Bull. Torrey Club. **48**: 41. 1921.
On Carduaceae, III:
Silphium trifoliatum L.
Known in Pennsylvania from a single collection from Cumberland county;—eastern and central United States.

147. Puccinia Smilacis Schw. Schr. Nat. Ges. Leipzig **1**: 72. 1822.

Dicaeoma Smilacis Kuntze, Rev. Gen. **3**³: 470. 1898.
On Smilaceae, O, I, II, III:
Smilax glauca Walt.
Smilax sp.
Apparently not common in Pennsylvania;—eastern United States.

148. Puccinia Sorghi Schw. Trans. Am. Phil. Soc. II. **4**: 295. 1832.

Dicaeoma Sorghi Kuntze. Rev. Gen. **3**[3]: 470. 1898.

On Poaceae, II, III:

Zea mays L.

Common in Pennsylvania;—throughout the United States.

The pycnia and aecia of this heteroecious species are known to occur on Oxalis sp. They have been frequently collected in the middle west but have not been recorded from Pennsylvania.

149. Puccinia suaveolens (Pers.) Rostr. Forh. Skand. Nat. **11**: 339. 1874.

Uredo suaveolens Pers. Obs. Myc. **2**: 24. 1799.

Bullaria suaveolens Arth. Result. Sci. Congr. Bot. Vienne 346. 1906.

On Carduaceae, O, I, II, III:

Cirsium arvense (L.) Scop.

Common in Pennsylvania;—eastern and middle western United States.

This rust appears to be perennial. The infected plants are dwarfed and yellow, and often the season's growth is killed. As a rule infected shoots do not mature blossoms.

150. Puccinia tenuis (Schw.) Burrill, Bot. Gaz. **9**: 188. 1884.

Caeoma (Aecidium) tenue Schw. Trans. Am. Phil. Soc. II. **4**: 293. 1832.

Allodus tenuis Arth. Result. Sci. Congr. Bot. Vienne 345. 1906.

On Carduaceae, O, I, III:

Eupatorium urticaefolium Reich.

Apparently not common in Pennsylvania;—eastern United States.

151. Puccinia troglodytes Lindr. Medd. Stockh. Hogsk. Bot. Inst. **4**[2]: 6. 1901.

Dicaeoma troglodytes H. S. Jackson, Proc. Ind. Acad. Sci. **1915**: 461. 1916.

On Rubiaceae, II, III:

Galium triflorum Michx.

Not common in Pennsylvania;—northeastern United States.

The pycnia and aecia of this rust are not known.

152. Puccinia urticata (Link) Kern, Mycologia **9**: 214. 1917.

Caeoma urticatum Link, in Willd. Sp. Pl. **6**[2]: 62. 1825.

Dicaeoma urticae Kuntze, Rev. Gen. **3**: 467. 1898.

On Urticaceae, O, I:

Urtica gracilis Ait.

On Cyperaceae, II, III:

Carex Baileyi Britton

Carex crinita Lam.

**Carex stricta* Lam.

Fairly common in Pennsylvania;—northern United States.

153. Puccinia Veratri (DC.) Duby, Bot. Gall. 890. 1830.

Uredo Veratri DC.; Poir. in Lam. Encyc. **8**: 224. 1808.

Dicaeoma Veratri Kuntze, Rev. Gen. **3**: 471. 1898.

On Melanthaceae, II, III:

Veratrum viride Ait.

Fairly common in Pennsylvania;—western United States and in mountainous regions in the east.

The pycnia and aecia are known to occur on several species of *Epilobium* principally in the western part of the United States.

154. Puccinia Vernoniae Schw. Trans. Am. Phil. Soc. II. **4**: 296. 1832.

Bullaria Vernoniae Arth. Mycologia **9**: 302. 1917.

On Carduaceae, O, I, II, III:

**Vernonia Noveboracensis* (L.) Willd.

Known in Pennsylvania from the collection of Schweinitz (2919) only;—southeastern United States.

155. Puccinia Violae (Schum.) DC. Fl. Fr. **6**: 62. 1815.

Aecidium Violae Schum. Enum. Pl. Saell. **2**: 224. 1803.

Dicaeoma Violae Kuntze, Rev. Gen. **3**[3]: 471. 1898.

On Violaceae, O, I, II, III:

Viola blanda Willd.
Viola canadensis L.
Viola conspersa Reichenb.
Viola cucullata Ait.
Viola eriocarpa Schw.
Viola fimbriatula J. E. Smith
**Viola incognita Forbesii* Brainerd
Viola leconteana Don.
Viola pallens (Banks) Brainerd
Viola papilionacea Pursh
**Viola primulifolia* L.
Viola pubescens Ait.
Viola striata Ait.

Common in Pennsylvania;—throughout the United States.

156. Puccinia virgata Ellis and Ev. Proc. Acad. Phila. 1893: 154. 1893.

Dicaeoma virgatum Kuntze Rev. Gen. **3**[3]: 471. 1898.

On Poaceae, II, III:

**Sorghastrum nutans* (L.) Nash.

Rare in Pennsylvania;—southeastern and central United States.

Known from Pennsylvania only by the single collection of Schweinitz (No. 2820). The pycnia and aecia are unknown.

157. Puccinia Windsoriae Schw. Trans. Am. Phil. Soc. II. **4**: 295. 1832.

Puccinia omnivora Ellis and Ev. Bull. Torrey Club. **22**: 59. 1895.

Dicaeoma Windsoriae Kuntze, Rev. Gen. **3**[3]: 471. 1898.

On Poaceae, II, III:

**Tridens flavus* (L.) Hitchc.

Known in Pennsylvania only by the single collection of Schweinitz (No. 2914);—northeastern United States and locally in southern United States.

The pycnia and aecia are known to occur on *Ptelea trifoliata L.* but have never been recorded from Pennsylvania.

158. Puccinia Xanthii Schw. Schr. Nat. Ges. Leipzig **1**: 73. 1822.

Micropuccinia Xanthii Arth. & Jackson; Arth. Bull. Torrey Club. **48**: 42. 1921.

On Ambrosiaceae, III:

Ambrosia trifida L.

Xanthium chinense Mill.

Xanthium italicum Mor.

Xanthium pennsylvanicum Wallr.

Common in Pennsylvania;—United States east of the Rocky Mountains.

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